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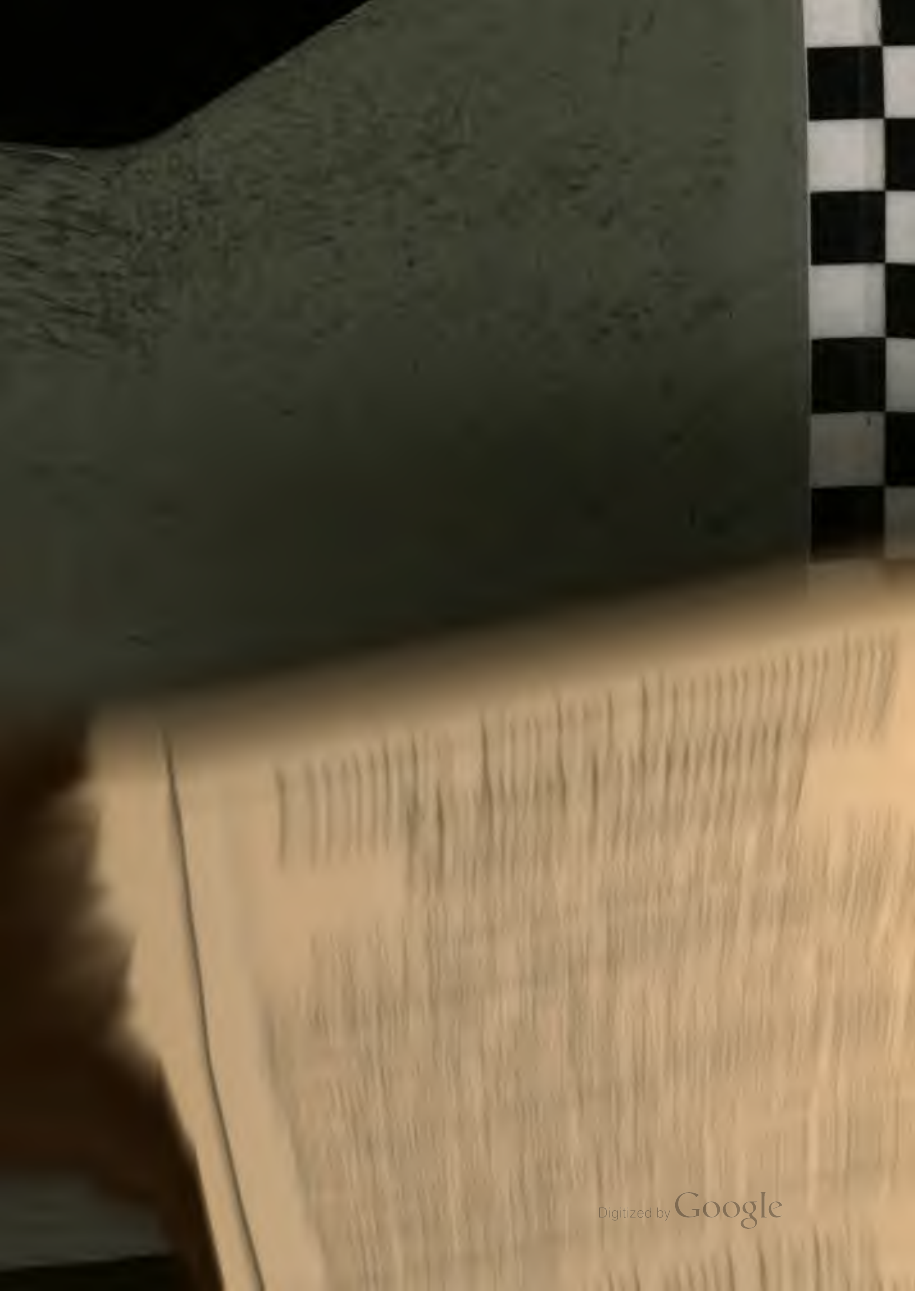
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WITH ESPECIAL REFERENCE TO THE
PHYSIOLOGICAL ACTION OF DRUGS

BASED ON THE NINTH REVISION OF
The U. S. Pharmacopœia
INCLUDING ALSO MANY UNOFFICIAL REMEDIES

BY
A. D. BUSH, B.S., M.D.
PROFESSOR OF PHYSIOLOGY AND PHARMACOLOGY MEDICAL DEPARTMENT,
UNIVERSITY OF SOUTHERN CALIFORNIA

EIGHTH EDITION, REVISED

PHILADELPHIA
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PREFACE TO THE EIGHTH EDITION

The text of this edition has been thoroughly revised and brought into conformity with the ninth revision of the U. S. Pharmacopœia. Many new articles and paragraphs on important drugs have been inserted, and several articles have been rewritten. Material considered obsolete, or comparatively unimportant, has been removed, and the whole work has been revised to conform with the best pharmacologic and therapeutic information.

"Intended chiefly for medical students, brevity of statement is one of the principal features of this compend. At the same time, the essentials of the subject have been kept in view; from a desire to make the book not only the best of its kind, but a compact compendium of the established maxims of therapeutical science, and the most advanced views concerning the physiological actions of drugs. The preparations noted under each title are those in most general use; to have described all would have been to unnecessarily burden the student's memory."

The purpose of such a text is to furnish a concise resumé of the relatively more important data. It is hoped that this revision will meet the commendation of teachers, students, and practitioners whenever such a brief summary is sought.

A. D. BUSH.

LOS ANGELES.

EXPLANATION

An Asterisk (*) before the name of a drug or preparation signifies that it is *not official* in the Ninth Revision of the U. S. Pharmacopœia.

The Sign (?) after a statement of physiological action signifies that the question is disputed and as yet remains unsettled.

Doses given are those for adults, the average doses of the U. S. Pharmacopœia following in brackets, thus [av. gr. x]. *For children* Young's rule is the most convenient one, viz.—add 12 to the age, and divide by the age to get the denominator of a fraction, the numerator of which is 1.

Thus, for a child two years old, $\frac{2 + 12}{2} = 7$, and the dose is one-seventh of that for an adult. Of powerful narcotics scarcely more than one-half of this proportion should be used. Of mild cathartics, two or even three times the proportion given may be employed. For *hypodermic injection* the dose is usually from one-half to two-thirds of that by the mouth, by *the rectum* from one and one-fourth to one and one-half of the same; the proportions varying with the activity of the agents employed.

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WEIGHTS AND MEASURES

APOTHECARIES' (TROY) WEIGHT

| Pound | Ounces | Drachms | Scruples | Grains |
|-------|--------|---------|----------|--------|
| lb. | ℥ | ʒ | ℥ | gr. |
| 1 | = 12 | = 96 | = 228 | = 5760 |
| | 1 | = 8 | = 24 | = 480 |
| | | 1 | = 3 | = 60 |
| | | | 1 | = 20 |

METRIC WEIGHTS

| | |
|----------------------|---------------------------------|
| 1 Milligramme, 0.001 | = gr. $\frac{1}{60}$ |
| 1 Centigramme 0.01 | = gr. $\frac{1}{6}$ |
| 1 Decigramme, 0.1 | = gr. $1\frac{1}{2}$ |
| 1 Gramme, 1.0 | = gr. 15.432 |
| 1 Kilogramme, 1000 | = { lb. 2.7 Troy lb. 2.2 Av. |

APOTHECARIES' MEASURE

| Gallon | Pints | Fl'ounces | Fl'dr'ms | Minims |
|--------|-------|-----------|----------|----------|
| C. | O. | ℥ | ʒ | ℥ |
| 1 | = 8 | = 128 | = 1,024 | = 61,440 |
| | 1 | = 16 | = 128 | = 7,680 |
| | | 1 | = 8 | = 480 |
| | | | 1 | = 60 |

APPROXIMATE EQUIVALENTS

| | |
|-----------------|----------------|
| 1 ℥ or 1 grain, | = 0.06 gramme |
| 1 ℥ or 1 ʒ, | = 4.0 grammes |
| 1 ℥ | = 30.0 grammes |
| 1 ʒ | = 31.0 grammes |
| 1 ℥ Glycerin, | = 37.0 grammes |
| 1 ℥ Syrups, | = 40.0 grammes |

A COMPEND OF MATERIA MEDICA AND THERAPEUTICS

INTRODUCTION

Drugs (*Drugan*, to dry) are material agents of any kind employed in the treatment of disease. The term was formerly applied to vegetable medicaments in their original form, and is still, by many persons, used in a similar sense.

Pharmacology, or the Doctrine of Drugs (*φάρμακον*, a drug, *λόγος*, a discourse), is the science which treats of the drugs employed in medicine. It embraces, therefore, in its scope, all of *Materia Medica* and *Therapeutics* relating to drugs. By a few writers this term is employed in a more restricted sense, so as to include only the physiological action of drugs—a subdivision of the *Materia Medica*, and a subject which is more correctly designated by the term *Pharmacodynamics* (see below).

Pharmacy is the name of the *art* which supplements the *science* of *Pharmacology*, viz., the art of preparing drugs according to the requirements of the pharmacologist, and of dispensing them on the prescription of the therapist. It includes a thorough knowledge of the *Materia Medica*, an acquaintance with the theories and manipulations of chemistry, and an intimate practical experience in many special operations peculiar to itself.

MATERIA MEDICA AND THERAPEUTICS

Materia Medica is that branch of *Pharmacology* which treats of the substances used as medicines, and describes their origin, composition,

physical characteristics, chemical properties, modes of preparation and administration, and their physiological and toxicological actions.

Pharmacodynamics (φάρμακον, a drug, δύναμις, power) signifies the discussion of the physiological action of drugs—that is, the modifying power of drugs upon the normal physiological activity of the human organism.

Toxicology (τοξικόν, a poison, λόγος, a discourse) teaches of the effects of drugs when administered in poisonous doses; also, of their drug-antagonists and chemical antidotes.

Therapeutics (θεραπεύειν, to attend upon) relates to the treatment of disease, and includes the discussion of all matters relating to the science and art of healing. Not only does it consider the application of medicines to the alleviation or cure of disease, but it embraces the employment of all other agents which are capable of contributing to the accomplishment of that result.

The operations of Nature herself, the actions of the various substances described in the *Materia Medica*, also those of food, clothing, climate, heat, cold, electricity, and of all other remedial agents, forces, and measures—are all included in the term *Therapeutics*, which may be divided into two grand divisions, viz.:

NATURAL THERAPEUTICS, including the operations of the *Vis Mediatricis Naturæ*—the modes and processes of healing which occur independently of Art, for the spontaneous decline and cure of disease. There is no fact in science more fully established than that the living organism is in itself adequate to the cure of all its curable disorders.

APPLIED THERAPEUTICS comprises the application by Art, of agents foreign to the living organism, for the purpose of *aiding* Nature to restore the body to a comparatively healthy condition.

When used in connection with *Materia Medica*, the term *Therapeutics* is restricted to the remedial uses of those substances only which are generally considered medicinal. When systematically discussed under the various titles of these substances, or under the names of the diseases treated therewith, the matter is termed the *Special Therapeutics* of a certain article or of a particular disease. When arranged so as to present certain great principles, which may be deduced from the mass of isolated therapeutical observations, it is termed *General Therapeutics*. Thus we say “the special therapeutics of Arsenic,” “the special therapeutics of Rheumatism,” “the general therapeutics of digestion.” Other divisions

of the subject, constantly referred to in professional conversation and literature, are those designated by the terms Empirical Therapeutics and Rational Therapeutics.

By **EMPIRICAL THERAPEUTICS** we mean the employment of a drug, or other remedial agent or measure, in a certain case of disease, for the sole reason that some person had previously used it successfully in a case which was apparently identical with the one under treatment. Necessarily the original method in Therapeutics, its reign has continued to the present time, and it is by many authorities lauded as the Therapeutics of Experience, founded on observation and experiment. At best, however, it is utterly unscientific; and would be destructive to all exactness in therapeutical progress, if permitted to rule unchallenged. It is a mere elaboration of Mrs. A's advice to her daughter, Mrs. B, to give her baby hot saffron tea for the measles, because Mrs. C's great grandmother had brought a family of ten safely through the disease with no other medicinal aid.

RATIONAL THERAPEUTICS is the very antithesis of Empiricism, as it consists in the employment of remedies with a definite object, and for reasons based on known laws of the remedies and of the diseases. When working by this method we administer a certain drug in a certain disease, with a more or less clearly defined idea of the morbid conditions present, and of the modifying action of the drug upon those conditions. Based, as it is, upon pathology and pharmacodynamics, these upon physiology, and it upon chemistry and biology, its progress must be slow, being dependent upon the advances made in all these fundamental branches of knowledge.

PHARMACOPŒIAS AND DISPENSATORIES

A **Pharmacopœia** is the official list of drugs and their preparations recognized by the medical profession in a certain country, as **THE PHARMACOPŒIA OF THE UNITED STATES OF AMERICA** (U. S. P.), **The British Pharmacopœia** (B. P.), etc. In other countries this list has the force of law, being issued under governmental auspices; but in the United States, it has only the prestige of a professional publication, being revised every ten years by a convention of delegates representing the medical and pharmaceutical professions. The ninth decennial revision of the U. S. Pharmacopœia was published in 1916 and became official from September 1st.

A **Dispensatory** is a Commentary upon one or more of the national pharmacopœias, and treats of the medicinal substances official therein and their preparations, as also of such unofficial ones as are of especial interest. It is a private publication, having only such authority as is conceded to the reputation of its author. The three great dispensatories are American publications, and are veritable drug-encyclopædias, so elaborately do they deal with the subjects treated of by them. They are:

The Dispensatory of the United States of America, generally known as the U. S. Dispensatory, Philadelphia.

The National Standard Dispensatory, formerly entitled the National Dispensatory, Philadelphia.

The American Dispensatory is the recognized authority of the "eclectic" physicians, Cincinnati.

OFFICIAL PREPARATIONS

The Preparations Official in the U. S. Pharmacopœia number 239, and may be divided into liquid and solid preparations. The former may be subdivided into groups named after their principal bases, viz.:

LIQUID PREPARATIONS

Acetone preparations, all Oleoresins, except that of Cubeb. Ether is now used instead of Acetone.

Acetous, the Vinegar of Squills.

Alcoholic, the Fluidextracts, Tinctures, Spirits, Elixirs; one Oleoresin, that of Cubeb; one Liniment, that of Belladonna.

Aqueous, Waters, Solutions, Infusions, Decoctions, Syrups, Honeys, Mucilages, Emulsions, Mixtures; the last five containing sweet or viscid substances.

Ethereal, the 3 Collodions.

Glycerines, the 5 Glycerites.

Oleaginous, the Liniments and Oleates, except the Liniment of Belladonna.

SOLID PREPARATIONS

| | | | |
|----------|------------|----------------|---------------|
| Cerates. | Ointments. | Powders. | Triturations. |
| Extracts | Plasters. | Resins. | Troches |
| Masses. | Pills. | Suppositories. | |

Besides the above-mentioned there are the *Natural Preparations*, namely, the Alkaloids, Glucosides, and other Neutral Principles, also the Acids, Alkalies, etc.

Aceta, Vinegars, are solutions of the active principles of certain drugs in dilute acetic acid. They number only 1, the Vinegar of Squill, made by maceration and straining, and containing the soluble principles from 10 per cent. of the drug.

Alkaloids are active, nitrogenous principles existing in plants, from which they are extracted by chemical art. They are organic bases, forming salts with acids, and regarded as compound ammonias, products of albuminous decomposition in the plant-cells during the process of growth. Like ammonia, they all contain N, with C and H; most of them also containing O, though a few are devoid of the latter element, occurring as oily liquids, viz., Nicotine, Coniine, Sparteine, Piperidine, Pyridine, and Trimethylamine. A few containing O occur also as liquids, Lobeline, Lupuline, Muscarine, Pelletierine, and Pilocarpine. Alkaloids are alkaline in reaction, sparingly soluble or insoluble in water, but readily soluble in alcohol; while their salts are more soluble in water than in any other liquid. Their solutions are intensely bitter. They are easily decomposed by alkalies or alkaline carbonates; and are precipitated from their solutions by a solution of Iodine in Iodide of Potassium, by Potassium-mercuric Iodide, and by Picric, Phospho-molybdic, Phosphotungstic, and Tannic Acids. They generally have a powerful, physiological action, and their official names always end in *ina* (*ine*). Allied to the alkaloids are the organic products:

Leucomaines and Ptomaines, the former being alkaloidal substances produced by decomposition of albuminous matter in the living animal tissues during the normal processes of waste; and the latter being similar substances produced by putrefaction. Many of the ptomaines are identical with vegetable alkaloids.

There are 23 official alkaloids, under either their own names or those of their salts, including Pelletierine and Veratrine, which are mixtures of alkaloids. They are named as follows:

| | | | |
|---------------|-----------------|----------------|--------------|
| Aconitina. | Cocaina. | Hyoscyamina. | Quinina. |
| Apomorphina. | Codeina. | Morphina. | Scopolamina. |
| Atropina. | Colchicina. | Pelletierina. | Sparteina. |
| Caffeina. | Homatropina. | Physostigmina. | Strychnina. |
| Cinchonina. | Hydrastina. | Pilocarpina. | Veratrina. |
| Cinchonidina. | Hydrastininina. | Piperina. | |

Unofficial, but important alkaloids are:

| | | | |
|------------|-----------|------------|------------|
| Berberina. | Coniina. | Duboisina. | Gelsemina. |
| Brucina. | Curarina. | Emetina. | Muscarina. |

Aquæ, Waters, are aqueous solutions of volatile substances, which may be either solids, liquids or gases. They are dissolved either by solution in cold or hot water, by filtration through an absorbent powder, by percolation through cotton saturated with the substance, or by dis-

tillation. They number 20 in all, including three forms of Aqua itself, viz., Water, Distilled Water, and Sterilized Distilled Water.

Cataplasmata, Poultices, are well-known devices for applying heat and moisture to an external part, and are sometimes medicated with anodyne, counterirritant, or disinfectant agents. They are prepared at the residence of the patient, the prescription calling for the ingredients only. The Pharmacopœia no longer recognizes any as official.

Cerata, Cerates, are unctuous preparations, similar to ointments, but of a much firmer consistence, as they all contain wax (*cera*), and do not melt below 104°F. There are 3 official cerates, including *Ceratum* itself, which is made by fusing together 30 parts of White Wax, 50 of Benzoinated Lard, and 20 of White Petrolatum.

Chartæ, Papers, are strips of paper medicated by impregnation with medicinal substances, or by coating therewith. An example is *Charta Sinapis*, now *Emplastrum Sinapis*, which is used as a counterirritant application. The formerly official *Charta Potassii Nitratis* is unsized paper impregnated with nitre, and intended for use by inhalation of its fumes while burning.

Collodia, Collodions, are liquid preparations, having for their base a solution of gun-cotton in a mixture of Ether and Alcohol. They number 3, and are intended for external use.

Confectiones, Confections, are medicinal substances formed into a mass with sugar, honey, water, etc., with the object of rendering them palatable and preserving them from change. They are no longer official.

Decocta, Decoctions, are aqueous preparations of vegetable drugs, made by boiling them in water for 15 to 30 minutes, and adding enough water to make the finished product of 5 per cent. strength, unless otherwise directed. They are not desirable preparations, as heating is injurious to the active principles of most plants. A general formula is official for these preparations.

Elixiria, Elixirs, are aromatic, sweetened preparations, containing active medicinal agents in small quantity, and made with a menstruum of Alcohol and Water. There are 2 official Elixirs, one (*Elixir Aromaticum*) being practically an alcoholized syrup, flavored with Orange, and intended as an excipient for use with extracts, salts and tinctures in prescriptions

Emplastra, Plasters, are solid compounds, of tenacious but pliable consistence, and intended for external application. They are prepared

by incorporating the medicinal substances with certain bases, to make a mass, which is then spread evenly on chamois-skin, muslin or kid-skin. The official Plasters number 7.

Emulsa, Emulsions, are aqueous liquid preparations containing an insoluble medicinal substance (as an oil or a resin) in a state of minute subdivision, and suspended therein by the aid of some viscid excipient, as gum. The official Emulsion number 4. They are further considered under UNOFFICIAL PREPARATIONS.

Extracta, Extracts, are solid or semi-solid preparations, obtained by evaporating solutions of vegetable principles. The drug is first powdered, and then percolated with an aqueous or alcoholic menstruum to exhaustion, when it is evaporated at a temperature not to exceed 122°F., to a pilular consistence, and in some cases has a small quantity of glycerin added to keep the mass from becoming hard. There are 25 official Extracts. They should not be made by evaporating Fluidextracts.

Fluidextracta, Fluidextracts, are "concentrated liquid preparations of vegetable drugs," prepared by percolation and partial evaporation, with various menstrua and "containing Alcohol either as a solvent or as a preservative." They are of uniformly definite strength if the crude drugs are so, a cubic milliliter, or fluid gramme, representing in each case the medicinal powers of one gramme of the drug; or, approximately, one minim of the finished preparation representing the active constituents of one grain of the drug. There are 49 official Fluidextracts, and several hundred unofficial ones, one manufacturing firm alone carrying over 400 on their trade-list; whereas even some of the official ones are inert.

Glucosides, are organic compounds, belonging to the group of *Neutral Principles* which exist in plants; and which are resolved into *glucose* and some other principles by the action of reagents or natural ferments. Few, if any, of these compounds, contain any N, but they all contain C, H, and O; and among them are some very active principles. Like other neutral principles, their titles end, in Latin, in *inum* (English *in*); and the official ones are three, viz.:

Glycyrrhizinum.

Salicinum.

Strophanthinum.

Unofficial, but important Glucosides are:

Adonidinum.

Digitalinum.

Jalapinum.

Arbutinum.

Digitaleinum.

Picrotoxinum.

Colocynthinum.

Digitoninum.

Saponinum.

Besides these, there are several other substances recognized by names which terminate in *inum*, *in*, but which have no relationship to the group of Glucosides. Among them are:

Aloinum, an official neutral principle from Aloes.

Benzinum, a purified distillate from Petroleum.

Benzoinum, an official balsamic resin from *Styrax Benzoin*.

Chinoidinum, an unofficial mixture of *Cinchona* alkaloids.

Chrysarobinum, an official principle from Goa-powder.

Elaterinum, an official principle from *Elaterium*.

Glycerinum, an official liquid from fats or fixed oils.

Lupulinum, a glandular powder from hops.

Pancreatinum, an official mixture of pancreas enzymes.

Pepsinum, an official ferment from the hog's stomach.

Picrotoxinum, a neutral principle from *Cocculus Indicus*.

Pyroxylinum, an official gun-cotton, used in Collodion.

Santoninum, an official principle obtained from *Santonica*.

Glycerita, Glycerites, are mixtures of medicinal substances with glycerin, of which 5 are now official.

Infusa, Infusions, are aqueous preparations of vegetable drugs, using boiling water, and made in the proportion of 5 per cent. of the drug, unless otherwise directed. The official Infusions are 12 in number, varying from $1\frac{1}{2}$ to 6 per cent. of drug to menstruum.

Linimenta, Liniments, are thin, oleaginous preparations, for external use with friction, and are made by dissolving various drugs in oily liquids, or in alcoholic liquids containing fatty oils. There are 8 official Liniments, 1 of which has Cotton-seed oil as its base, 1 has Alcohol and Water, 1 Linseed Oil, 1 Oil of Turpentine, 2 Alcohol, and 1 Oil of Sesame.

Liquores, Solutions, include all aqueous solutions of non-volatile substances, except the syrups, infusions and decoctions, which naturally form distinctive classes. There are 25 official Solutions; of which 13 are simple aqueous solutions, the rest being chemical aqueous solutions, in which the dissolved substances are altered by chemical action and new ones formed.

Massæ, Masses, Pill-masses, are prepared as described under *Pilulæ*, those which are official numbering 2, viz., *Massa Ferri Carbonatis*, and *Massa Hydrargyri*.

Mellita, Honeys, differ from Syrups merely in their having honey as their base. The *Oxymel* and *Oxymel Scillæ* of the B. P. are similar prepa-

rations, with the addition of Acetic Acid. There are 3 official Honeyæ, including the two forms of Honey itself, viz., Mel, Mel Depuratum, and Mel Rosæ.

Misturæ, Mixtures, are aqueous preparations of *insoluble* substances, held in suspension by a suitable vehicle. In extemporaneous pharmacy, however, the term *Mixture* is applied to every fluid compound intended for internal use, except a few which have distinctive titles, as Emulsions, Draughts, Enemas, Elixirs, and Drinks. There are 2 official Mixtures, Mistura Cretæ, and Mistura Glycyrrhizæ Composita.

Mucilagines, Mucilages, are thick, viscid liquids, prepared by dissolving gum in water, or by extracting with water the mucilaginous principles of certain plants. They are easily spoiled, and hence should be kept in small quantities only. There are 2 official Mucilages.

Oleata, Oleates, are liquid solutions of metallic salts or alkaloids in Oleic Acid, intended for external use. They are not definite chemical compounds, though the term *Oleates* is also employed in the drug trade to distinguish certain solid preparations which are claimed to be chemical compounds of the same acid with various bases. There is only 1 official Oleate, that of Mercury (25 per cent.).

Oleoresinæ, Oleoresins, are liquid preparations, consisting principally of natural oils and resins extracted from vegetable drugs by percolation with Ether. In one case, that of Cubeb, the extractive agent is Alcohol. They are the most concentrated liquid preparations of drugs which can be produced, and there are 6 official members of the class.

Pilulæ, Pills, are spherical masses composed of medicinal agents, and intended to be swallowed whole. The "*pill-mass*" or "*mass*" consists of the active ingredients and the *excipient*, the latter being the substance which gives to the mass its adhesive and plastic qualities. Besides the 2 official Masses enumerated above, under **MASSÆ**, there are 7 official Pills, in the composition of which some 12 different excipients are specified.

Pulveres, Powders, consist of dry substances in a state of minute subdivision, obtained by pulverization; the ingredients being rubbed together in a mortar until reduced to a fine powder and thoroughly mixed. There are 7 official Pulveres, one of which is really a Trituration, viz., the Pulvis Ipecacuanhæ et Opii.

Resinæ, Resins, are solid preparations obtained by precipitating the resinous principles of plants from their alcoholic solutions by the agency

of water, Resina excepted. There are 4 official Resins, viz., Resina (Rosin), and the Resins of Jalap, Podophyllum, and Scammony.

Spiritus, Spirits, are alcoholic solutions of volatile substances, which may be solids, liquids or gases. The official Spirits number 15 and are prepared either by simple solution, by solution with maceration, by gaseous solution, by chemical reaction, or by distillation.

Succi, Juices, are expressed from fresh medicinal plants, and preserved by the addition of alcohol. Limonis Succus (lemon-juice), formerly official in the U. S. P., has been supplanted by Limonis Cortex.

Suppositoria, Suppositories, are solid bodies containing medicinal substances, and intended for introduction into the rectum, vagina or urethra. There is but one official Suppository, that of Glycerin, in which Stearic Acid is employed to give the requisite consistence. The Pharmacopœia prescribes a general formula for these preparations, and directs that the medicinal constituent may be incorporated with Cacao-butter (Oleum Theobromæ), Glycerinated Gelatin, or Sodium Stearate.

Syrupi, Syrups, are concentrated solutions of Sugar in water or in aqueous liquids, sometimes containing Acetic Acid, and occasionally Alcohol. They are termed *simple*, *medicated*, or *flavored*, according as they are simple solutions of sugar in water alone, or contain soluble medicinal substances, or flavoring ingredients. The official syrups number 19, several of which are superfluous.

Tincturæ, Tinctures, are alcoholic extracts of medicinal substances, all except one (Tincture of Iodine) being made from non-volatile bodies. They are prepared by percolation and maceration, the menstrua employed being chiefly Alcohol and diluted Alcohol of various strengths, though in 2 cases the Aromatic Spirit of Ammonia is used. There are 54 official Tinctures, varying in strength from 0.4 per cent. (Tinct. Opii Camph.) to 50 per cent. (Tinct. Lactucarii). The official tinctures are now practically in two classes as to strength, 10 per cent. for those of the more powerful substances, and 20 per cent. for the others, with a few exceptions: Tincture of Iodine is really a Spiritus.

Tincturæ Herbarum Recentium, Tinctures of Fresh Herbs, is the title of a general formula for the preparation of the so-called "Green Tinctures," according to which, unless otherwise directed, 50 grammes of the fresh herb, bruised or crushed, are to be macerated in 100 mls of Alcohol for 14 days, then expressed and filtered.

Triturationes, Triturations, are finely comminuted powders, each consisting of a suitable medicinal substance and Sugar of Milk as a diluent, in the proportion of 10 per cent. of the former to 90 of the latter. There is but one official Trituration (*Trituratio Elaterini*), though the *Pulvis Ipecac et Opii* practically belongs to this class, except in respect of the proportions prescribed.

Trochisci, Troches, also called Pastilles, or Lozenges, are small flattened cakes consisting of medicinal substances incorporated with Sugar, Mucilage of Tragacanth, etc. There are 5 official Troches.

Unguenta, Ointments, are soft, fatty mixtures of medicinal agents with a basis of lard, petrolatum, or fixed oils; intended for application to the skin by inunction. There are 20 official Ointments, including *Unguentum* itself, which is a mixture of Benzoinated Lard 80, and White Wax 20.

Vina, Wines, when medicated are practically Tinctures; hence, being superfluous preparations, have been dropped from the official list.

UNOFFICIAL PREPARATIONS

Balnea, Baths, are often medicated, and then become medicinal preparations. In prescribing for them, the ingredients only are enumerated, with directions that they shall be added to the necessary quantity of water, usually about 20 gallons.

Bolus, Bolus, is a solid preparation, larger than a pill, but intended to be swallowed whole.

Bougia, Bougies, or Pencils, are urethral and uterine suppositories, made long and slim for adaptation to those canals. They consist of various solid medicaments, astringents usually, which are incorporated with a basis of Gelatin 3 and Glycerin 1, melted together. The compound is finally run into well-oiled tubes, in which it cools to the proper shape, and is then cut into the proper lengths.

Cachets, Wafers, are thin disks made of flour and water, forming a very convenient vehicle for the administration of many powdered drugs, such as Quinine Sulphate, Rhubarb, etc. The wafer is first moistened with a very small quantity of water, next the powdered drug is dropped upon it, the edge of the wafer is bent inward so as to completely cover up the powder, and the whole then forms a bolus, which can be swallowed easily.

Capsulæ, Capsules, are short tubes made of gelatin, and such sizes that one slips over the other, so as to form a cover for it. They are a very convenient means of administering oils or other nauseous drugs, as when filled they are swallowed as easily as large-sized pills, and quickly dissolve in the gastric fluids, setting their contents free in the stomach. Another form is the *Soluble Elastic Capsule*, each one containing a dose of such medicines as Castor Oil, Cod-liver Oil, etc., enclosed in a yielding wall of gelatin, which bears any ordinary pressure, and accommodates itself readily to the shape of the œsophagus.

Collunarium is a nasal douche or wash, consisting of a mixture of various substances with water, to which a little glycerin is often added.

Collyrium is a similar preparation for use on the eye, an eye-wash, and generally contains a soluble, astringent salt, dissolved in rose-water or filtered (not distilled) water, in the proportion of gr. j-v to the ℥.

Discus, a Disk, is a thin scale of Gelatin, medicated as required, for local application to the eye. The various mydriatics, also several mild astringents and anodynes, are put up in this form for use by ophthalmologists.

Dragée is the French name for a sugar-coated pill; e.g., "*Dragées Ferrugineuses*."

Electuaria, Electuaries, are preparations of a similar character to Confections, consisting of medicinal powders, etc., beaten up with sugar, honey or molasses, to the consistence of a thick paste, and administered with a spoon, like preserves. The term is now practically obsolete.

Emulsa, Emulsions, are mixtures which contain an oil or a resin minutely subdivided and in a state of "suspension" in the mixture; the suspension being accomplished by the aid of some viscid excipient, as gum, soap, alkali, or yolk-of-egg. *Natural Emulsions* are such as exist ready formed in nature, as milk, the yolk-of-egg, etc.; and also the emulsions formed by rubbing up gum-resins with water, the members of that class of substances (Ammoniacum, Asafetida, Myrrh, etc.) each containing, along with its resin, a sufficient amount of gum to make a perfect emulsion when triturated with water. There are six official Emulsions (see *ante*), but these preparations are usually extemporaneously prescribed by the physician.

Excipients used for emulsification are Acacia, Tragacanth (either these gums in powder or their Mucilages), Yolk-of-egg, Liquor Potassii Hydroxidi, Tincture of Senega, Tincture of Quillaja Milk, Syrups, Soap,

etc. To give good results, the following proportions in parts by weight are recommended, viz.:

Gum Acacia. Water.

1 part of Fixed Oils or Copaiba requires..... $\frac{1}{4}$ and $\frac{3}{4}$
 1 part of Balsam of Peru requires..... 2 and $1\frac{1}{4}$
 1 part of Oil of Turpentine requires..... 1 and 1

Enemata, Enemas, Clysters, are liquid preparations, for injection into the rectum, and may be laxative, demulcent, nutritive, stimulant or vermifuge in character. Their diluent is always water, which should be warm or tepid, and with which are incorporated such medicaments as may be desired. They may consist of water alone, as a wash for the purpose of cleansing the lower bowel.

Fotus, a Fomentation, is a Lotion used hot, and may consist of water alone, or medicated with a soluble salt, or perhaps alcohol, turpentine, etc.

Gargarysma, a Gargle, is a mixture or solution for application to the pharyngeal mucous membrane, and usually contains some astringent or disinfecting salt, with a vegetable astringent perhaps, and frequently honey, all in aqueous solution or mixture.

Glycecol is a jelly troche, the base of which is a mixture of gelatin or isinglass with glycerin, called Glycecolloid.

Granulum, a Granule, is a very small pill, also called *Parvule*, and usually composed of alkaloidal or other powerful drugs.

Haustus, a Draught, is a mixture consisting of a single dose, and usually about one or two fluidounces in volume. The old-time *Black Draught* is, perhaps, the best known preparation of this class, but having been promoted from the ranks, it is now commissioned in official pharmacy under the title *Infusum Sennæ Compositum*, The Compound Infusion of Senna.

Inhalationes, Inhalations, also called *Vapores*, Vapors, are medicines in the form of a vapor, a gas, or an atomized spray, intended for inhalation for their local action on the respiratory mucous membrane. The best apparatus for the production of these preparations is the steam-atomizer; but many substances may be inhaled from the surface of hot water, from a sponge in a wide-mouthed bottle surrounded by a hot cloth, or from a heated slab of stone or iron.

Injectiones, Injections, are aqueous preparations, intended for introduction into the cavities of the body by means of a syringe, and are

termed *vaginal*, *urethral*, *vesical*, *nasal*, *aural*, *hypodermic*, etc., according to the locality wherein employed. A special form of syringe is employed in each case.

Lotio, A Lotion or Wash, is an aqueous solution or mixture of medicinal agents, intended for external use, and usually consisting of some soluble, astringent salt, dissolved in water, together with, perhaps, some glycerin or alcohol. The best known Lotion is "*Leadwater and Laudanum*," of daily use as an anodyne, refrigerant and astringent application, though the Laudanum has only a weak anæsthetic action until absorbed.

Pessaria, Pessaries, are suppositories of large size for use in the vagina. The term is also applied to certain mechanical contrivances used by gynecologists to support the uterus in position, and hence its medicinal application is all but obsolete.

Pigmenta, Paints, are fluid or semi-fluid preparations for external use, to be applied with a brush over inflamed joints, in skin-diseases, or to the pharyngeal mucous membrane. The familiar application of *Tincture of Iodine*, painted over the skin as a counterirritant and sorbefacient, is the best known example of this class.

Potus, A Drink, is a mixture or solution, intended to be used *ad libitum*, and usually consists of a Potassium salt, or a mineral acid, in dilute solution, sweetened and flavored to the patient's taste.

ADMINISTRATION OF MEDICINES

Medicines may be introduced into the circulation by various routes, as the gastro-intestinal tract, the rectum, the respiratory tract, the veins and arteries, the subcutaneous cellular tissues, and the integument itself.

The **Gastro-intestinal Route** is the one most frequently employed, being the most convenient. The remedies, after being swallowed, find their way into the current of the circulation, through the walls of the gastro-intestinal blood-vessels and the lacteals. When the stomach is empty and its mucous membrane healthy, crystalloidal substances in solution may pass through the walls of its vessels with rapidity. Colloidal substances (fats, albumin, gum, gelatin, etc.) require to be digested and emulsified before they can be absorbed.

The **Rectum** will absorb many substances applied in the forms of *Enemata* or *Suppositories*. Those most suited to this route are the salts of the alkaloids in solution, especially those of *Morphine*, *Atropine*, and

Strychnine, the latter being absorbed more rapidly per rectum than by the stomach. Acid solutions, if not too frequently repeated, are also well administered by this channel.

The **Respiratory Tract** admits of the rapid absorption of medicinal substances through its extensive blood-supply. The inhalation of vapors or atomized fluids, the insufflation of powders into the nares, fauces, larynx, etc., and the use of a medicinal nasal douche, are methods whereby this channel may be utilized.

The **Veins** are only used as a route of medication in emergencies, when the other channels are not available, and where immediate action is necessary to the preservation of life, the operation being a highly dangerous one. The injection intravenously of *Saline Solutions* in the collapse of cholera, diabetic coma, etc., *Blood* or *Milk* as a last resort in excessive hemorrhage, epilepsy, uremia, the collapse of cholera, etc., and a solution of *Ammonia* for the bites of venomous reptiles, hydrocyanic-acid poisoning, Opium narcosis, Chloroform asphyxia, etc., are instances admitted in practice.

Arterial Transfusion has also been performed successfully in a number of cases, and is considered safer than venous transfusion when a large quantity of fluid has to be introduced into the circulation. A special apparatus is employed for these purposes, known as Aveling's Transfusion Syringe, but the ordinary Dieulafoy's aspirator slightly modified, may be used with safety and convenience. The danger of the operation lies in the liability of the introduction of air into the circulation, an occurrence which may cause instant death in the human subject.

The **Hypodermic Method** is the introduction of medicines into the organism by injecting them into the subcutaneous areolar tissue, from which they are quickly absorbed by the lymphatic and capillary vessels.

The medicines must be in solution, of neutral reaction and freshly prepared, the usual menstruum being distilled water; though spring water filtered will answer just as well, and much better than distilled water which has been standing several days, and exposed from time to time to the air. The solution is to be injected *beneath* the skin, by a hypodermic syringe, care being taken to avoid puncturing a vein. The most suitable localities for the injection are the *external* aspect of the arms and thighs, the abdomen, the back, and the calves of the legs. On the external aspect of the thigh, just in front of the great trochanter, there is an area of some inches square, over which the insertion of a fine hypodermic needle is not felt, so barren is the skin in that region of sensitive nerve filaments.

After nearly filling the syringe with the solution to be used, the needle should be screwed on tightly; and with the instrument held in a vertical position, point uppermost, the excess of solution over the amount required should be ejected, thus expelling air-bubbles and filling the needle itself. The needle should then be quickly inserted until its point has passed *beneath* the skin, when the piston may be pressed

down slowly, delivering the solution gradually so as to avoid rupturing the tissue. If the solutions are freshly prepared with clean water, the needles kept clean and sharp, and the injection be made *beneath* the skin, *not into it*, there will be no risk of producing abscesses with the agents ordinarily employed.

Parenchymatous Injection is the delivery of a medicine deeply into the tissues, either to affect a muscle itself or to locally influence some important nerve-trunk. The principal agents used in this manner are Strychnine for palsied muscles, Chloroform for sciatic and other neuralgias, Salts of Cocaine for local anaesthesia, and Phenol for deep-seated inflammations.

The Skin is an active absorbent of crystalloidal substances when its epidermis or cuticle is removed. By this route there are four methods of introducing medicaments into the circulation, viz., the Enepidermic, Epidermic and Endermic Methods, and Inoculation.

The **Enepidermic Method** consists in placing the medicine in simple contact with the epidermis, no friction being used to hasten its penetration. Solutions of the alkaloids in Chloroform and Oleic Acid pass by osmosis in this manner with comparative ease, but aqueous solutions act very slowly, and alcoholic ones with great difficulty if at all.

The **Epidermic Method** consists in the use of friction to promote the passage of the medicament between the cells of the epidermis. Mercurial Ointment, Cod-liver Oil, and other fats, Oleates, etc., are used in this way for their local and systemic effects.

The **Endermic Method** obviates the difficulty of absorption through the cuticle by removing the latter through the agency of a blister, and then powdering the medicament over the surface of the denuded derma, but the method is very painful and unpopular, and has been largely discarded.

Inoculation is the introduction of medicinal agents through the scraped or punctured skin by an operation similar to that employed for vaccination.

The reaction of the system to a drug will often vary greatly according to the mode of administration, response being more prompt and marked the more rapidly the drug enters the circulation. Again, some drugs are toxic when given hypodermically, and yet practically inert by stomach.

CLASSIFICATION OF MEDICINES

Every medicine should be first studied as an individual, both with respect to its physiological actions and its therapeutical applications.

When the student has thus familiarized himself with the characteristic features of each article of the *Materia Medica*, he may commence to seek out their more delicate lights and shades, by comparing them, one with another, according to their general scope of action and application. In order to do this intelligently, some method of classification becomes necessary, to guide and direct the mind and to assist the memory in grasping the subject firmly.

Acids, considered physiologically and therapeutically, are medicines which in concentrated form act usually as caustics, to destroy the tissues; but when administered internally in medicinal doses they are supposed to check the production of glands having acid secretions if coming into contact with the mouths of their ducts, and to increase the production of those having alkaline secretions. Thus, a dilute *acid* given before meals will *check* the production of the *acid gastric juice*, but will *stimulate* that of the *alkaline pancreatic juice*. They should always be largely diluted for internal administration. The principal Acids are Acetic, Citric and Benzoic, from the vegetable kingdom, and Nitric, Phosphoric, Sulphuric and Hydrochloric from the mineral kingdom.

Alkalies, or **Antacids**, from the same standpoint, are agents which neutralize acids, act as escharotics on the tissues, and are supposed to check alkaline and stimulate acid secretions, when in contact with the mouths of the ducts of the glands producing them. Thus, a dilute *alkali* given before meals may *stimulate* the production of the *acid gastric juice*, and if applied to the mouth of the pancreatic duct may *check* the secretion of the *alkaline pancreatic juice*. Alkalies may be subdivided into two groups, named, from their physiological actions, *Direct Antacids*, those which lessen the acidity in the stomach, and *Indirect* or *Remote Antacids*, which have no power over the acidity in the stomach, but are oxidized in the blood, and excreted as Carbonates in the urine, and lessen its acidity. The following List of Alkalies comprises the chief members of both groups, and also some which have the actions of both. They should all be largely diluted before administration.

Direct Antacids

(Lessen Acidity in the Stomach)

Liquor Potassii Hydroxidi.

Carbonates and Bicarbonates of K,
Na, Li, Mg, and NH₄.

Lime-water. Chalk.

Remote Antacids

(Lessen Acidity of the Urine)

Liquor Potassii Hydroxidi.

Carbonates and Bicarbonates of K,
Na, Li, Mg, and NH₄.

Potassium Acetate and Citrate.

Magnesia.
Aromatic Spirit of Ammonia.

Sodium Acetate and Citrate.
Lithium Citrate.

Alteratives are agents which *alter* the course of morbid conditions, modifying the nutritive processes while promoting waste, and thus indirectly curing many chronic diseases. *Mercury*, *Iodine* and *Arsenic* are the typical alteratives, the first breaking up new deposits, the second stimulating the absorbent circulation, and the last acting like the first on pulmonary deposits, and being almost specific to the chronic diseases of the skin. Those who denounce the term *Alterative* as "a cloak for ignorance," have never been able to replace it by any more definite designation for a group of agents whose effects upon disease are *facts* of clinical medicine. The principal Alteratives are the three above-named, also Antimony, Colchicum, Sulphur, Stillingia and Phosphorus.

Analgesics or **Anodynes** (ἄλγ, without, ἀλoς, ὀδυνη pain) are agents which relieve pain, either by impairing the conductivity of the sensory nerve fibres, or by depressing the cerebral centres of perception and sensation. Opium is the most efficient of all the analgesics. The *General Anodynes* act when taken internally, and affect the whole organism, the *Local Anodynes* affect the part to which they are applied, some by direct depression of the terminal nerve-organs in the skin, others by reducing the local circulation. The Local Anodynes are enumerated under Anæsthetics; the General Anodynes include Opium, Morphine, Belladonna, Atropine, Aconite, Antipyrine, Acetanilide, Hydrated Chloral.

Anaphrodisiacs diminish the sexual appetite and lower its functional power either by depressing the special nervous apparatus or by decreasing the local circulation. The chief anaphrodisiacs are Tobacco, Cocaine, Belladonna, Gelsemium, Lupulin, Camphor (at last), Opium (at last), Bromides, Iodides, all Nauseants, Purgation, Cold locally, Vegetable Diet. A drop of a 4 per cent. solution of Cocaine upon the glan penis will destroy all erection-power for a quarter to half an hour.

Anæsthetics (ἄλγ, without, ἀσθησις, perception) are agents which temporarily destroy sensation. The *General Anæsthetics* are volatile substances, which, when inhaled, produce more or less complete unconsciousness and loss of sensation (anæsthesia), also lessened motor power. The *Local Anæsthetics* act similarly to the local anodynes (see above), except that, while the latter diminish the sensibility of the part, the former destroy it entirely, for a time. The principal agents belonging to this group are the following-named:

General Anæsthetics

Ether (Ethyl Oxide).
 Chloroform.
 Ethyl Chloride.
 Ethyl Bromide.
 Methyl Bromide.
 Nitrous Oxide.

Local Anæsthetics

Extreme Cold. Ice.
 Ether spray.
 Methyl Chloride spray.
 Phenol. Creosote. Gualacol.
 Cocaine. Eucaine. Novocaine.
 Chloretone. Orthoform.

Anhidrotics (*ἀν*, without, *ἰδρωσ*, sweat) are agents which check perspiration, acting in either of three ways, the reverse of those for the diaphoretics. The most energetic member of this class is *Atropine*, and others are Muscarine, Ergot, Zinc Salts, Acids locally, Cold locally, Opium, etc. The latter in small doses checks perspiration, but in large doses promotes it (?).

Antagonists are agents which directly oppose each other, in some or all of their physiological actions, and therefore may be used, one against the other, in a case of poisoning by either, to *counteract* its effect upon the organism, after it has been absorbed, and when, therefore, the time for an antidote has passed. Antagonistic action takes place in the blood and tissues, and is applicable almost entirely to vegetable poisons. *Antagonistic Measures* are such mechanical procedures as tend to the same end, the antagonism of the effects of poisons, and include Artificial Respiration, Faradism of certain muscles, Douching, Motion, Rest, etc.

For example, in a case of poisoning by *Digitalis*, the antidote would be *Tannic Acid*, because it forms with the active principle of *Digitalis* a compound (Tannate of Digitalin), which is not readily soluble, and is therefore comparatively innocuous. But as this new compound is not wholly inert, it must be removed from the body; an antidotal measure is, therefore, employed, viz., *Evacuation of the Stomach*, which may be accomplished by the administration of *Zinc Sulphate* or any other emetic, or by the use of a stomach-pump.

But, supposing that sufficient time had elapsed, between the ingestion of the poison and the administration of the antidote, for some degree of absorption to have occurred, and that we observe evidences of the presence of the poison in the blood, we must resort then to an antagonist. Now, *Aconite* and *Morphine* antagonize the cardiac action of *Digitalis*, but *Saponin* and *Senegin* are its most complete antagonists, their counteraction extending throughout the whole range of its physiological effects. Having made our selection, we would use one of these agents cautiously, being careful not to substitute its toxic action for

that of the original poison; and we would aid its influence by enjoining absolute *Rest* in the recumbent posture, which is an antagonistic measure of great importance against the effects of *Digitalis* upon the heart.

In most cases of poisoning by powerful vegetable drugs assistance is not obtained until absorption has proceeded so far that antidotes are of little value, and the chief reliance must be placed upon the appropriate physiological antagonist, and such supporting measures as will sustain the action of any vital function which shows signs of failing. In this way we endeavor to maintain life until the excretory functions of the organism have had time to eliminate the poison by way of the natural channels.

Under each title in the following pages its appropriate Antidotes and Antagonists are given, for every substance which is liable to be used as a poison.

Anthelmintics (*ἀντι*, against, *ἐλμύς*, a worm) are drugs which destroy (vermicides), or expel (vermifuges) worms inhabiting the intestinal canal. The principal vermifuges are the purgatives Castor Oil, Jalap and Scammony, and the vermicides are classed according to the worm they are each most efficient against, thus:

Thread-worm (*Oxyuris Vermicularis*), Alum, Ferrous Sulphate, Lime-water, Quassia, Sodium Chloride, Tannin, all by enema.

Round-worm (*Ascaris Lumbricoides*), Santonin, Spigelia, Chenopodium, internally, with Senna or Calomel.

Tape-worms (*Tania*, etc.), Aspidium (*Filix mas*), Kamala, Cusso, Granatum (*Pelletierine*), Pepo, Turpentine, Chloroform.

Hook-worm (*Uncinaria*, *Ankylostomum*), Thymol, Aspidium.

Antidotes (*ἀντι*, against, *δωωμι*, I give) are agents which act upon poisons in such a manner as to alter their composition, rendering them more or less innocuous, and so *preventing* their toxic action being exerted upon the organism. Antidotal action takes place in the alimentary canal, upon such portion of the poison as is unabsorbed, and is applicable to vegetable as well as to mineral poisons. *Antidotal Measures* are such medicinal or mechanical processes as tend to remove a poison from the body, either before or after the use of an antidote; and include Emesis, the use of the Stomach-pump, Purgation, etc. The term *Antidotal Treatment* covers the employment of both antidotes and antidotal measures, and is often used in a still wider sense, namely, to mean all the treatment of a case of poisoning, including the use of Antagonists as well as that of Antidotes.

Antiperiodics are agents which check the progress of certain periodically recurring diseases, lessening the severity of their paroxysms and preventing their return, probably by a toxic action upon the microbes, whose development in the blood by successive crops is supposed to cause the disease. The great antiperiodic is *Quinine*, next in efficiency is *Arsenic*, and others of less importance are *Salicin* and its derivatives, the other alkaloids of Cinchona, Bebeeru Bark and its alkaloid, Iodine and Eucalyptol.

Antiphlogistics (*ἀντι*, against, *φλογίζω*, I burn) include all measures and medicines which reduce inflammation, the principal among them being:

Mercury and *Opium* for inflammations of serous membranes, *Aconite* and *Antimony* for those of the respiratory apparatus, and *Veratrum Viride* in puerperal metritis (?). Others are Digitalis, Ergot, Ipecac, Venesection, Local Depletion, Purgation, Counterirritation, Cold, and Rest in the recumbent position. Cold sponging is the best measure.

Antipyretics (*ἀντι*, against, *πυρετός*, fever) are agents which reduce high body-temperature. This may be done by 5 different actions working upon 2 principal lines, viz.:

- | | |
|-----------------------------------|---|
| (a) Lessening Heat-production, by | { (1) Diminishing tissue-change. |
| | { (2) Reducing the circulation. |
| (b) Promoting Heat-loss, by | { (3) Dilating cutaneous vessels, thus increasing heat-radiation. |
| | { (4) Promoting perspiration, its evaporation lowering the temperature. |
| | { (5) Abstracting heat from the body. |

The following list of Antipyretics includes a few for each of the above-named actions, to which the numbers refer in each case, viz.:

| | | | |
|---------------|----------------------|--------------------|-----------------|
| Quinine, 1. | Alcohol, 1, 3. | Antipyrine, 1. | Cold Drinks, 5. |
| Berberine, 1. | Nitrous Ether, 3, 4. | Acetphenetidin, 1. | Ice to body, 5. |
| Digitalis, 2. | Acetanilide, 1. | Cold Bath, 5. | Wet Pack, 5. |
| Aconite, 2. | | | |

Antispasmodics (*ἀντι*, against, *σπασμός*, a spasm) are agents which prevent or allay spasm of voluntary or involuntary muscles in any portion of the organism. In this group is included a long list of drugs, some of which act (1) by tonic stimulation of the nerve-centres, and thereby of the coördinating power and the circulation, others (2) by direct depression of the motor centres, and others (3) by paralyzing the end-

organs of the vaso-motor nerves. A few (4) depress all the vital functions, and a large number (5) stimulate the muscular fibres of the intestines to expel gaseous accumulations. The following list includes the principal antispasmodics, the numbers referring to the special action of each, as stated above, viz.:

| | | |
|--------------|-------------------|-------------------|
| Alcohol, 4. | Tobacco, 4. | Amyl Nitrite, 2. |
| Ether, 4. | Lobelia, 4. | Asafetida, 5. |
| Atropine, 2. | Hellebore, 4. | Cajuput, 5. |
| Morphine, 2. | Hydrocy. Acid, 4. | Aromatic Oils, 5. |
| Aconite, 4. | Bromides, 2. | |

Antizymotics (*ἀντι*, against, *ζυμωσις*, fermentation) are agents which arrest all fermentative processes, not only those due to the action of Organic Ferments (diastase, pepsin, ptyalin, etc.), but also those depending on Organized Ferments (the yeast-plant, bacteria, cocci, etc.). They may be divided into two groups, viz.:

Antiseptics (*ἀντι*, against, *σπντικὸς*, putrefaction) are those which retard or prevent septic decomposition, by destroying the bacilli which produce it, or by arresting their development. The principal Antiseptics are Mercuric Iodide; Mercuric Chloride, Iodide and Oxide; Mercurous Chloride, Formaldehyde, Hydrogen Dioxide, Potassium Permanganate, Sulphurous Acid, Sulphites and Hyposulphites, Salicin, Quinine, Thymol, Phenol, Cresol, Creosote, Alcohol, Eucalyptol, Borax, Chlorine, Chlorides and Chlorates.

Disinfectants are those which destroy the germs of infectious diseases. They act in several different modes; some are *Oxidizants*, as Lime, Chlorine, Iodine, Bromine, Heat 230°–250°F., etc.; others are *Desulphurants*, as Ferrous Sulphate, Lime, etc.; and others are *Absorbents*, as Charcoal, Dry Earth, etc. Many members of this group have the additional property of destroying foul smells, and are called *Deodorants*, such being Ozone, Earth, Lime, Charcoal, Ferrous Sulphate, Chlorine and Sulphurous Acid Gases, etc.

FERMENTATION is a general name for certain processes of decomposition, during which certain carbon compounds called *Ferments* act upon other carbon compounds, as on their food, splitting these latter up, setting free their elementary constituents, and thereby leading to the formation of still other carbon compounds, by the rearrangement of the freed molecules. These processes are of two kinds, viz.:

1. Those in which water is taken up (hydration), chiefly carried on by enzymes.
2. Those in which O is transferred from the H to the C association, as in lactic

and alcoholic fermentation, and the putrefactive processes, and are chiefly carried on by the agency of organized ferments.

THE FERMENTS producing these fermentative changes are also carbon compounds, and are divisible into two groups, viz.:

Enzymes, or Organic Ferments, have no definite structure, and are unorganised, i.e., not living, as Diastase, Ptyalin, Pepsin, etc.

Organised Ferments are minute, living organisms, as the moulds, yeast-plant, bacteria, and other members of the Protophytes, the lowermost class of plants, which, in the course of their life history, split up the carbon compounds in which they live, appropriating some part of their elements.

ANTIZYMOTIC DRUGS are drugs which arrest or inhibit these fermentative processes, either by destroying or by rendering inactive the causative ferments.

Aphrodisiacs (*Ἀφροδίστη*, Venus) are agents said to stimulate the sexual appetite and function, by direct or reflex action on the genital centres in the brain and spinal cord. Such are Nux Vomica, Cannabis, Cantharis, Phosphorus, Aurum, Alcohol, Opium (at first), Camphor (at first), Ergot, Iron, and Meat Diet, the last three being indirectly aphrodisiac, as are all measures which promote the general nutrition of the body. Any specific aphrodisiac action is very doubtful.

Astringents (*ad*, to, *stringo*, I bind) produce contraction of muscular fibre, and condensation of other tissues, also lessen secretion from mucous membranes. *Local Astringents* affect the part to which they are applied, as Tannic Acid, Alum, salts of Bismuth, Lead, Copper, Zinc, and Cadmium, the per-salts of Iron, the Mineral Acids; Galls, Kino, Catechu, and other plants containing Tannic Acid. *Intestinal Astringents* contract the intestinal vessels, diminishing the exudation therefrom and lessening the fluidity of the fecal discharges. The chief members of this class are the diluted Mineral Acids, and Acetic Acid, Lead Acetate, Silver Nitrate, Alum, Tannic and Gallic Acids, Zinc Oxide, Copper Sulphate, and the per-salts of Iron. Of these, the six last-named are the most powerful, and have a strong *constraining* action upon the intestinal mucous membrane, as well as their ordinary astringent action upon its vessels.

Cardiac Sedatives lessen the force and frequency of the heart's action. They are used to control palpitation and overaction of that organ, also to slow the pulse in febrile conditions in sthenic subjects, especially when local inflammation is the exciting cause thereof. Most of them are direct cardiac poisons, depressing both the heart-muscle and the motor ganglia. The list includes Aconite and Veratrum, also Muscarine, Pilocarpine, Saponin, Hydrocyanic Acid, Antimony, Potas-

sium salts and Digitalis, the last-named acting as a sedative by stimulation of the vagus centre and the cardiac muscle slowing the rate and giving regular rhythm to the action of the heart.

Cardiac Stimulants are such agents as rapidly increase the force and frequency of the pulse, in depressed conditions of the cardiac apparatus. The most rapid, energetic and available agents of this class are Ether, Heat and Ammonia, the last-named also stimulating the vaso-motor centre (?). The list also includes Sparteine, Atropine, Cocaine, Morphine (in small doses), Caffeine, Chloroform, Turpentine, the Aromatic Oils, Counterirritation, the continuous Galvanic Current, Nitroglycerin.

Cardiac Tonics in moderate doses stimulate the cardiac muscle, slowing and lengthening its contractions; but in large doses they produce irregular action of the heart, and some of them may cause sudden death by syncope if pushed to any great extent. The typical agent of this class is Digitalis, which also contracts the arterioles and greatly increases the blood-pressure. Others, less powerful and correspondingly safer, are Convallaria, Strophanthus, Squill, Cimicifuga and Erythrophloeum. The list also includes Caffeine (Helleborein and Adonidin (from Adonia vernalis (?)).

Carminatives (*carmino*, I soothe) aid in the expulsion of gas from the stomach and intestines, by increasing peristalsis, stimulating the circulation, etc. They are also diffusible stimulants. The most important members of this class are Asafetida, Capsicum, Cardamom, Fennel, Camphor, Ginger, Mustard, Pepper, and the Oils of Anise, Cinnamon, Peppermint and Pimento.

Cathartics, or Purgatives (*καθαρω, purgo*, I cleanse), are agents which increase or hasten the intestinal evacuations. According to their various degrees and modes of action, they are subdivided into several groups, as follows:

Laxatives, or Aperients, include those which have the most moderate action, of which Sulphur is the type, the group including also Magnesia, Figs, Prunes, Tamarinds, etc.

Simple Purgatives cause active peristalsis, and some irritation and griping. Senna is the type of this group, its list also including Rhubarb, Calomel, Castor Oil, Aloe, etc.

Drastic Purgatives act still more intensely, causing large watery stools, with much griping pain, tenesmus and borborygmi. Jalap is a repre-

sentative drastic, and the other chief agents of the group are Colocynth, Elaterium, Scammony, Gamboge and Croton Oil; all of which in large doses act as irritant poisons.

Saline Purgatives increase peristalsis, promote osmosis, stimulate the intestinal glands, and thus produce free, watery evacuations. The most commonly used Saline is Magnesium Sulphate, the well-known "Epsom salt," but the list is a long one, including all neutral salts of metals of the alkalies or alkaline earths, such as the Potassium and Sodium Sulphates, Sodium Phosphate, Potassium Tartrate and Bitartrate, Potassium and Sodium Tartrate, etc.

Hydragogue Purgatives (ὑδρω, water) include the most active of the drastics and the salines, those which remove a large quantity of water from the vessels. Elaterium, Gamboge, Potassium Bitartrate, and Croton oil, are the chief Hydragogues.

"Cholagogue" Purgatives (χολη, bile) indirectly stimulate the flow of bile, causing green-colored or "bilious" stools. Podophyllin is the typical "cholagogue," the others being Aloes, Rhubarb, Euonymin, and Iridin.

Cerebral Depressants lower or suspend the functions of the higher brain after a preliminary stage of excitement. Under this head may be included the Narcotics, the General Anæsthetics, the Hypnotics, and many of the Antispasmodics, all of which act upon the cells of the convolutions, and at first stimulating the cerebral functions, they produce after a time stupor, coma, and insensibility. The principal agents of this class are Alcohol, Opium, Chloroform, Bromides, Chloral and Tobacco.

Cerebral Excitants increase the functional activity of the cerebrum, without causing any subsequent depression or any suspension of brain-function. The chief members of this group are, Cannabis, Caffeine, Cocaine, and Strychnine. Belladonna sometimes acts thus.

Ciliary Excitants promote the expulsion of bronchial mucus by their reflex excitation of the tracheal and bronchial cilia when dissolved in the mouth. This group includes such agents as the Chlorides of Ammonium and Sodium, Potassium Chlorate, and Gum Acacia (?).

Deliriants excite the functional activity of the higher brain to such a degree as to disorder the mental faculties, and produce intellectual confusion, loss of will-power, delirium and even convulsions. They are all narcotics, though all narcotics are not deliriants. Among these agents are Belladonna, Stramonium, Hyoscyamus, Cannabis Indica,

Chloral, *Lupulus* (at first), *Opium* (at first), and *Alcohol* (in full doses).

Dental Anodynes employed locally in toothache due to caries exposing a nerve filament, are *Aconite*, and *Cocaine* salts; also *Phenol*, *Creosote*, *Chloral*, and *Potassium Chlorate*. A solution, containing the two first-named, applied on a pledget of cotton, will promptly relieve whenever the nerve is accessible. *Chloral* should never be employed for this purpose, as in solution sufficiently strong to be of any service it is very apt to cause sloughing of the gum, especially if injected thereinto by a hypodermic syringe, as is frequently done by ignorant dentists, who advertise the "extraction of teeth without pain."

Dentifrices (*dens*, a tooth, *frico*, I rub) are medicated pastes or powders employed with a stiff brush to cleanse the teeth and gums. Their base is usually *Chalk*, for its mechanical action and its alkaline quality; besides which, there should be some antiseptic, as *Quinine*, *Borax*, etc., and an aromatic stimulant, like *Myrrh*.

The teeth are injuriously affected by several drugs, especially the *Mineral Acids*, and the *Persalts of Iron*. These should always be administered through a glass tube, and the mouth should be rinsed out afterward with a weak alkaline solution.

Destructive Metamorphosis of the tissues is promoted by a large number of agents, most of which are classed as *Alteratives* or as *Astringents*, the principal ones being the following, viz., the *Alkalies*, *Vegetable Acids*, *Metals* and their salts, *Colchicum*, *Sulphides*, *Iodides*, *Tannic* and *Gallic Acids*, and the *Vegetable Astringents*.

Metabolism may be diminished by *Alcohol*, *Glycerin*, *Oils* and *Fats*, *Salicin*, *Quinine*, *Resorcinol*, etc.

Diaphoretics and **Sudorifics** (*διαφορεω*, I carry through; *sudor*, sweat, *facio*, I make) increase the action of the skin, and promote the secretion of sweat, those which act most energetically being designated by the latter title.

Simple Diaphoretics are those which enter the circulation and stimulate the sudoriferous glands during their elimination, as *Pilocarpus*, *Spirit of Mindererus* (*Liq. Ammonii Acetatis*), *Sweet Spirit of Nitre* (*Spiritus Ætheris Nitrosi*), *Alcohol*, *Salicylates*, etc.

Nauseating Diaphoretics, are those which act by producing relaxation and dilatation of the capillaries, as *Tartar Emetic*, *Ipecacuanha*, *Dover's Powder*, *Lobelia*, *Tobacco*, *Baths*, *Heat*, etc.

Refrigerant Diaphoretics are such as act by reducing the force of the circulation, and perhaps also by a specific action on the sweat-centre in the medulla, as the Potassium and Ammonium salts, Aconite, Veratrum, Cocaine, Tobacco, Pilocarpus, Ether, Nitrites, etc. (?).

Diluents are indifferent substances which, being absorbed, pass readily through the body, diluting its fluids and excretions. *Water* is the only true diluent, whatever form it may be disguised in, as teas, weak fluid foods, acidulated drinks, etc.

Discutients or *Resolvents* (*discutio*, I dissipate, *resolvo*, I unbind) are agents which promote the absorption of morbid products, probably by stimulating the lymphatic system. This group includes Iodine, Mercury, Arsenic, and Cadmium, also such local measures as Poulticing and Counterirritation.

Diuretics (*διουρησις*, urination) are remedies which increase the renal secretion, either by raising the general or local blood-pressure, by stimulating the secreting cells or nerves of the kidneys, or by flushing those organs, and washing them out. They are usually divided into *Refrigerant*, *Hydragogue*, and *Stimulant Diuretics*, according to their physiological action; or they may be classified according to the different purposes for which they are employed. Both these classifications are fully described under the title *DIURETICS*, at the end of the book.

Emetics (*ἔμεω*, I vomit) are agents which cause vomiting. They are subdivided into two groups, viz.:

Local Emetics act by irritating the end-organs of the gastric, œsophageal or pharyngeal nerves, and by reflex irritation of the vomiting centre. They include Alum, Mustard, Salt, the Sulphates of Zinc, Copper and Mercury, Tepid Water in quantity, Ipecac, Antimony.

Systemic or *General Emetics* act by direct irritation of the vomiting centre in the medulla, (a) through the medium of the circulation, as for example, Apomorphine, and those (b) which cause vomiting as one of their after-effects, as Senega and Squills, also Opium and its alkaloids.

Vomiting is an evacuant act which consists in compression of the stomach by the simultaneous spasmodic contraction of the diaphragm and abdominal muscles; and relaxation of its cardiac orifice by contraction of the radiating muscular fibres in the gastric wall. If both acts occur at the same time, the contents of the stomach are expelled and vomiting occurs: if, however, the two acts do not take place simultaneously, the contents of the stomach are retained, and the abortive

efforts are called *retching*. These acts are controlled and regulated by a nerve-centre in the medulla oblongata, which is closely connected with the respiratory centre, the muscular movements of vomiting being merely modified respiratory movements. This vomiting centre is ordinarily excited in two ways: (1) by the peripheral stimulation of afferent nerves going to it from other parts of the body; (2) by impulses sent down to it from the brain.

Anti-emetics are agents which lessen nausea and vomiting, some by a local sedative action upon the end-organs of the gastric nerves, the *Local Gastric Sedatives*; others by reducing the irritability of the vomiting centre in the medulla, the *General Sedatives*. The principal Anti-emetics are the following-named:

Local Gastric Sedatives

Arsenic. Bismuth. Ice.

Belladonna. (Opium.)

Alum. Creosote.

Calomel. Cerium Oxalate. Cocaine.

General Sedatives

Alcohol. Amyl Nitrite.

Nitroglycerin. Chloral.

Opium. Morphine.

Hydrocyanic Acid. Bromides.

Of these the most generally efficient is *Cocaine*, in 6-minim doses of a 4 per cent. solution every hour by mouth, for two or three doses.

Emmenagogues (ἐμμηνια, the menses, ἄγω, I move) are measures and remedies which restore the menstrual function. They may be divided into:

Direct Emmenagogues, which stimulate the uterine muscular fibre, and are Ecboic in large doses, as Ergot, (Borax), Quinine, Potassium Permanganate, etc.

Indirect Emmenagogues, which act by improving the blood and toning up the nervous system, such as Iron, Manganese, Mercuric Iodide and Strychnine, and local plethorafacients, such as Aloetic purgatives, Hot Hipbaths, Rubefacients to the thighs; Tonic remedies, etc.

Emollients and *Demulcents* (*emollio*, I soften, *demulceo*, I soothe) are substances which soothe and protect tissues to which they are applied. *Emollients* act as external demulcents, being used upon the cutaneous surface, to soften and relax the part, dilate the vessels, diminish tension, and protect from the air or from friction. *Demulcents* are generally of oleaginous or mucilaginous character, employed on the mucous membranes for similar purposes. The chief agents comprised in these two groups are as follows:

Emollients

Petrolatum (Vaselin).
 Soap Liniment. Starch.
 Adeps (Lard). Glycerin.
 Cocoa-butter (Ol. Theobromæ).
 Flaxseed Poultices. Olive Oil.

Demulcents

Isinglass. Bland Oils.
 Marsh-mallow. Honey.
 Tragacanth. Almond Oil.
 Acacia. Cetraria. Starch.
 Licorice. Glycerin. Olive Oil.

Errhines and Sternutatories are agents, which, when locally applied to the nasal mucous membrane, produce sneezing and increase of the nasal secretion. The first term (*ἐρ*, in, *ρὺν*, the nose), is usually applied to substances which simply increase the mucous discharge; the second (*sternulo*, I sneeze), to those which invariably produce the violent expiratory effort called sneezing. Both should be in powder-form for application. Another result of their use is the stimulation of the vaso-motor centre at the same time that they excite the respiratory centre, thus producing a contraction of the smaller vessels throughout the body, and consequently a general rise in the blood-pressure. This class includes Ammonia-vapor (dilute), Cubeb-smoke, etc., which are simple errhines, and the vapor of Ammonia-water, also Tobacco, Ipecacuanha, Sanguinaria, Ginger, Veratrum Album, etc., in powder, as snuff. Their use has been practically abandoned.

Escharotics or Caustics (*ἐσχάρα*, a slough, *καίω*, I burn) are substances which destroy the life of the tissue to which they are applied, either by abstracting its water, as Sulphuric Acid, or by corrosive deoxidation, as Bromine. The chief caustics are Potassa, Lime, Arsenic, Zinc Chloride, Silver Nitrate, Corrosive Sublimate, Mercuric Nitrate, Mineral Acids, Bromine, Zinc and Copper Sulphates. Chromic Trioxide is one of the most efficient, but must be carefully used, it being a violent poison.

Expectorants (*ex*, out of, *pectus*, the breast) are agents said to modify the broncho-pulmonary mucous secretion, and promote its expulsion. They, consequently, act as pulmonary sedatives, indirectly, and are subdivided into:

Nauseating Expectorants, in small doses increase osmosis from the inflamed mucous membrane, in large doses cause vomiting and the mechanical expulsion of the mucus. They also increase secretion generally, and lower the blood-pressure. Such are Antimonial salts (Tartar Emetic, etc.), Ipecacuanha, Lobelia, Pilocarpus, Apomorphine, Alkalies, etc.

This alleged exosmotic action is doubted.

Stimulant Expectorants are eliminated from the system largely by the

bronchial mucous membrane, which they at the same time stimulate, thus altering its secretion, and facilitating expectoration. [There exists no convincing evidence to justify this alleged pharmacodynamics.] They include the Ammonium salts, Balsams of Peru, Squill, Senega, Terebinthinates. Ammonium chloride is best administered by inhalation, in the form of nebulous vapor.

Galactagogues (γάλα, milk, ἀγω, I bring away) are medicines which are supposed to increase the lacteal secretion. The value of many of these is very doubtful, probably the most efficient being *Pilocarpus* (*Jaborandi*). Others are the leaves of the Castor-oil plant (*Ricinus communis*) locally, Anise and Fennel Milk and beverages are thought to help the secretion. Anemia must be corrected, sore nipples attended to, good food supplied, and tonics if needed.

Galactophyga (φείγω, I shun) are remedies which arrest the secretion of milk. The most efficient is *Belladonna* or its alkaloid *Atropine*, locally and internally. Others are *Potassium Iodide*, *Colchicum* with *Magnesium Sulphate*.

Hearing is affected by several drugs. *Strychnine* and *Morphine* increase the excitability of either the auditory nerve, or the auditory centre in the superior temporo-sphenoidal convolution, making that faculty much more acute than normal. *Quinine*, *Antipyrine* and *Salicin* produce hyperæmia of the auditory apparatus, and cause subjective noises, such as humming, buzzing or ringing, which are very unpleasant to their subject. Temporary deafness is often caused by *Quinine*, but it usually disappears soon after the administration of the drug is stopped.

Hepatic Depressants lower the functional activity of the liver, certain drugs acting upon certain of its functions, as follows, viz.:

Bile-production lessened by *Opium* and *Morphine*, *Quinine*, *Alcohol*, *Acetate of Lead*, and many purgatives.

Glycogen diminished by *Opium*, *Morphine*, *Codeine*, *Phosphorus*, *Arsenic* and *Antimony*.

Urea lessened by *Opium*, *Morphine*, *Colchicum*, *Alcohol* and *Quinine*.

Hepatic Functions, other than the biliary, are stimulated by the following-named drugs, viz.:

The Glycogenic Function is stimulated, and the production of *Glycogen* increased by *Sodium Bicarbonate*, *Amyl Nitrite* and *Nitro-hydrochloric Acid*.

Urea is increased by Arsenic, Antimony, Ammonium Chloride, Iron and Phosphorus.

Hepatic Stimulants and Cholagogues are two groups of agents supposed to have a selective action upon the biliary secretion, hence the term *Cholagogue*, from $\chi\acute{o}\lambda\eta$ (bile), and $\theta\gamma\omega$ (I bring away). The Hepatic Stimulants increase the functional activity of the liver-cells, and the amount of bile secreted; while the Cholagogues remove the bile from the duodenum, interfering temporarily with the entero-hepatic circulation, and preventing the reabsorption of bile by the portal vessels. Hepatic Stimulants may also be cholagogues, while the Cholagogues proper act by carrying off the bile and thereby hastening its excretion. The following list includes the principal drugs in both groups.

Hepatic Stimulants, Nitrohydrochloric Acid, Ammonium Chloride, Ipecac, Bile, Bile salts. Bile and the Bile salts are the only reliable hepatic stimulants we have.

Cholagogues, Mercurous Chloride (Calomel), Pil. Hydrargyri, Mercury with Chalk, and many other mercurials, Podophyllin, Iridin, Jalapin, Euonymin, Rhubarb, Colocynthin.

Hypnotics ($\pi\tau\tau\omicron\varsigma$, sleep) are agents which, in proper doses, induce sleep, without causing deliriant or narcotic effects. Many of the most efficient hypnotics are narcotic in full dosage (*narco-hypnotics*); others induce sleep by removing or suspending any cause interfering therewith (*indirect hypnotics*). The list of *pure hypnotics* includes the Bromides, Paraldehyde, Sulphonmethane (Sulphonal), Sulphonethyl-methane (Trional), Veronal, etc., which are described under **CHLORALUM HYDRATUM** in the following pages. Chloral is the most efficient of all hypnotics, but must be classed as a narco-hypnotic.

Irritants are substances, which, when applied to the skin, produce more or less of vascular excitement. When employed to excite a reflex influence on a part remote from their site, they are called **COUNTER-IRRITANTS**, and may be subdivided into the following groups, viz:

Rubefacients (*ruber*, red, *facio*, I make), those which cause redness (congestion) of the skin, as Mustard, Camphor, Iodine, Capsicum, Turpentine, Ammonia, Pitch, etc. The stronger agents of this subdivision are capable of destroying the tissue if left in contact with it for too long a time.

Epispastics, Vesicants, or Blisters, produce decided inflammation of the skin, and the outpouring of serum between the epidermis and the

derma. Cantharides is the agent most used for this purpose, but Mezereon and Euphorbium are equally efficient.

Pustulants affect isolated parts of the skin, as the orifices of the glands, etc., giving rise to pustules. Such are Croton Oil, Tartar Emetic, and Ipecacuanha.

Lithontriptics and *Antilithics* (λίθοι, a stone, ῥηθω, I wear down) are agents which are supposed to prevent the formation of concretions in the ducts (antilithics), or to dissolve said concretions when formed (lithontriptics). The efficiency of any agents, except water for the purposes named, is not now accepted. Those recommended in the past for the various concretions are as follows, viz.:

For Uric Acid Calculi, Distilled Water, Potash or Lithia, and salts of these metals, Magnesium Citroborate, Potassium Tartraborate, Piperazin.

For Phosphatic Calculi, Benzoic Acid and the Benzoates, especially Ammonium Benzoate, Dilute Nitric Acid.

For Calcium Oxalate Calculi, Dilute Nitro-hydrochloric Acid, Carbonated Waters, Lactic Acid, for the digestive disturbance.

For Biliary Calculi, Ether and Turpentine (Durande's Solvent), Sodium Salts, Castile Soap, Alkaline Waters, especially Vichy.

Motor-depressants lower the functional activity of the spinal cord and motor apparatus, and in large doses paralyze them directly. The principal members of this class are Alcohol, Ether, Chloroform, Curare, Opium, Aconite, Conium, Chloral, Tobacco, Lobelia, Belladonna, Gelsemium, Methyl-Strychnine, and Physostigma.

Coördination of Movement, or the Maintenance of the Equilibrium, is the function apparently governed by the cerebellum, and is markedly disturbed by the few drugs which specifically affect that organ, chief among them being *Alcohol*. In considerable doses this drug causes a staggering gait, and a tendency to fall, and different preparations thereof seem to affect different portions of the cerebellum. Intoxication by wine or beer is said to be accompanied by a tendency to fall sideways, that by whisky, especially Irish whisky, an inclination to fall on the face, and that by cider, a backward tendency; and these disturbances correspond exactly with those caused by injury to different lobes of the cerebellum (Brunton). *Apomorphine* in large doses seems to act upon the cerebellum or corpora quadrigemina, as the animal poisoned by it does not vomit, but moves round and round in a circle.

Motor-excitants are agents which increase the functional activity

of the spinal cord and the motor apparatus, producing heightened reflex excitability, disturbances of motility, and tetanic convulsions when given in large doses, their ultimate result being motor paralysis from overstimulation. Such are *Nux Vomica* and *Ignatia*, with their alkaloids, *Strychnine* and *Brucine*, also *Thebaine* the tetanizing alkaloid of *Opium*, and *Ergot*, *Picrotoxin*, *Digitalis*, *Pilocarpine*, etc.

Mydriatics are agents which cause dilatation of the pupil of the eye (mydriasis). Some act only when applied locally, others only when taken internally, but the principal ones, *Atropine* and its congeners, act both locally and internally, and at the same time, produce temporary loss of accommodation, the eye remaining focussed for distant objects, and the intra-ocular tension being increased. The loss of accommodation is due to the drug's causing paralysis of the ciliary muscle, and the dilatation of the pupil to its producing stimulation of the end-organs of the sympathetic nerve, and paralysis of the end-organs of the 3d cranial (motor oculi) nerve; the former increasing the power of the radiating muscular fibres of the iris, and the latter lessening the power of its circular fibres. The smallest quantity of *Atropine* which will affect the pupil is stated by Donders as the $\frac{1}{400,000}$ of a grain. *Cocaine* acts by stimulation of the ends of the sympathetic alone, and does not paralyze the 3d nerve. As a mydriatic it has peculiar qualities, which should make it preferred by eye-surgeons. These are referred to in detail in the body of the book under the title *COCA*. The chief mydriatics are:

| | | |
|---------------------|---------------------|----------------------------------|
| <i>Atropine.</i> | <i>Duboisine.</i> | <i>Euphthalmin.</i> |
| <i>Hyoscyamine.</i> | <i>Homatropine.</i> | <i>Anæsthetics (at last).</i> |
| <i>Daturine.</i> | <i>Cocaine.</i> | <i>Gelsemine (locally only).</i> |

Myotics ($\mu\beta\omega$, to close) are agents which produce contraction of the pupil (myosis). The principal local myotic, and the only one used in ophthalmic practice is *Physostigmine* (*Eserine*), which acts by stimulating the circular muscular fibres of the iris, at the same time contracting the ciliary muscle so that the eye is accommodated for near objects only, and diminishing intra-ocular tension, in all of which respects it exactly antagonizes the action of *Atropine* (see above). The other myotics are as follows, viz.:

| | | |
|---------------------|--------------------------------|---|
| <i>Pilocarpine.</i> | <i>Ergot.</i> | <i>Nicotine (locally).</i> |
| <i>Muscarine.</i> | <i>Gelsemine (internally).</i> | <i>Anæsthetics (at first myotics, but</i> |
| <i>Morphine.</i> | <i>Lobeline (internally).</i> | <i>mydriatics at last).</i> |

Narcotics (νάρκη, stupor) are drugs which lessen the relationship of the individual to the external world (Brunton). At first excitant to the higher brain, then soon cause profound sleep, characterized by increasing stupor, and if the dose be sufficient, coma, insensibility, and finally death by paralysis of the centres in the medulla which govern respiration and the other functions of organic life. Narcotics are closely related to stimulants, Opium being a good illustration, in the different stages of its action, of a stimulant followed by narcotic effects. Such agents give us the means of lowering hyper-acute perception, of inducing sleep, and of soothing the vital functions by rest, all of which are means of great therapeutical value. The principal narcotics are Opium, Cannabis Indica, Alcohol, Belladonna, Humulus, Chloral, Chloroform, Ether, etc.

Oxytocics or **Ecbolics** (ὀξύς, quick, τόκος, childbirth; ἀβολή, abortion) are agents which tend to produce abortion, by stimulating the gravid uterus to contract upon its contents, perhaps by direct irritation of the uterine centre in the cord. The chief oxytocics are Ergot, Savin, and Pilocarpine, but any violent purgative, or gastro-intestinal irritant, may produce abortion by reflex action; if the patient is one who aborts easily.

It is in this way that all the *Volatile Oils* act as abortifacients, also Tansy, Colocynth, Pennyroyal, and many other drugs used by women for that purpose; all of which are dangerous to the woman's life, in doses large enough to excite uterine action. As for the physician who should prescribe such agents for the purpose indicated, he would stand on a par with a drunken husband who kicks his pregnant wife in the abdomen. Both operators initiate uterine contractions in the same manner, viz., by reflex action from a powerful impression upon the woman's system, made in the one case, by an irritant *boot* with a *brute* behind it, in the other case by an irritant *drug* with a *scoundrel* behind it.

Pancreatic Stimulation may be obtained by the administration of Ether internally, or by galvanism of the organ. The Pancreas is depressed by Atropine, also by any agent which induces nausea and vomiting.

Parasiticides (παράσιτος, a parasite, *cædo*, I kill) destroy the various animal and vegetable organisms which live upon the human body. They are generally employed in the form of lotions, ointments or oleates, and include the following articles, viz., Sulphur, Sulphites, Sulphurous Acid, Iodine, Sulphur Iodide; Mercury and its Chlorides, Nitrate, Oxide, and Ammoniated Mercury; Phenol, Storax, Petroleum, Staphisagria, Balsam of Peru, etc.

Protectives, are articles employed to cover an inflamed or injured part, and to protect it from the air, water, friction, etc. *Collodion* is

in most general use, but Cotton Wool, and certain plasters, the Adhesive, Lead or the Soap Plaster, may be employed.

Pulmonary Sedatives, relieve cough and dyspnoea, by lessening the irritability either of the respiratory centre or of the nerves of respiration. Some act by direct depression of the respiratory centre (as the *Depressants*); others by lessening sensory receptivity; and others by lowering the excitability of the vagus end-organs in the lungs and other afferent filaments throughout the respiratory tract. The most powerful of these directly sedative agents is Opium, and next are Hydrocyanic Acid and Potassium Cyanide. Others are Belladonna and its congeners, which stimulate the centre but depress the vagus end-organs, and arrest secretion in the bronchi; Cannabis Indica, Quebracho, Codeine, Amyl Nitrite, Turpentine, Ethyl Iodide, Conium, Tobacco, etc.

Refrigerants are remedies which impart a sensation of coldness (*refrigero*, I cool), and thereby allay thirst and restlessness. Among them are the Vegetable and Mineral Acids (greatly diluted, especially the latter), Ice, Cold Water, Effervescing drinks, Fruit juices, and many diaphoretics.

Renal Depressants are agents which lower the activity of the renal cells, thereby lessening or suspending the urinary secretion. The drugs which act thus are Morphine, Quinine and Ergot. Instead of acting as a diuretic *Digitalis* may stop the secretion of urine, by so stimulating the vaso-motor centre as to greatly contract the renal vessels, and arrest the renal circulation (Brunton). This it might do if a preparation were used which was deficient in Digitoxin or Digitalin, the dilators of the renal arteries (see under DIGITALIS). The same is true of *Caffeine* and *Strychnine*, both diuretics, hence it is well to combine these with other diuretics which dilate the renal vessels, as the Nitrites (Nitrous Ether, etc.), and Alcohol. *Digitalis* itself contains agents which possess the power of doing both these actions, and hence it is the ideal diuretic.

Respiratory Depressants lower the action of the respiratory centre, rendering the respirations slow and shallow. The chief members of this group are Morphine (in full doses), Apomorphine, Hyoscine, Gelsemium, Aconite, Veratrine, Conium, Chloral, Alcohol, Ether, Chloroform, Cold, etc. Many of these at first excite the centre, but soon depress it.

Respiratory Stimulants exalt the function of the respiratory centre in the medulla, quickening and deepening the breathing. The most im-

portant of these agents are Strychnine, Atropine, Cocaine, Caffeine, Ammonia, Heat, Electricity, Alcohol (briefly), Ether (briefly), Morphine (in small doses), and Aspidospermine.

Restoratives promote the constructive metamorphosis, and include the Foods, Hæmatics, Tonics, and many stimulants.

Foods supply material to renew some structure of the body, or to maintain some vital process; and are derived from the three natural kingdoms, the vegetable, animal, and mineral, as Oils and Fats, Sugar, Starch, Gum, Water, Alcohol, Calcium Phosphate, Sodium Chloride, etc.

Hæmatics (αἷμα, the blood) augment the quantity of hæmatin in the blood, enriching its red corpuscles, and thus restoring the quality of that tissue. They include principally Iron and Manganese, and their compounds.

Tonics (τόνος, tension) improve the tone of the tissues on which they have specific action, increasing the vigor of the entire system. Those which act most generally are Strychnine, Quinine, and Iron; those acting more on particular organs will be found enumerated under the titles of the organs or tissues which they affect specifically, as **CARDIAC TONICS**, **RESPIRATORY STIMULANTS**, etc.

Sedatives (σέδο, I allay) are agents which lessen the functional activity of organs, lower motility and diminish pain, and so exert a soothing influence on the system. So we have *General Sedatives*, which include the narcotics and anæsthetics, the *Local Sedatives*, which affect a part only, also Pulmonary, Spinal, Nervous, Vascular, Cardiac Sedatives, etc., all of which are indicated under their appropriate titles.

Sialogogues (σπάλλον, saliva, & γω, I carry off) are drugs which promote the secretion and flow of saliva and buccal mucus. They may be subdivided into two groups, viz.:

Topical Sialogogues, which act by reflex stimulation, including the Acids and Alkalies, Ether, Chloroform, Mustard, Ginger, Pyrethrum, Mezeoreon, Tobacco, Cubeb, Capsicum, Rhubarb, etc.

General Sialogogues, which influence the glands or their secretory nerves, viz., Pilocarpus (Jaborandi), Muscarine, Physostigma, Ipecac, Iodides, Mercurials, Antimonials, etc.

Agents which diminish the secretions of the salivary and buccal glands are named *Antisialics*. The typical member of this group is Atropine, which acts by paralyzing the terminal filaments of the secretory nerve. Physostigmine antagonizes this paralysis, but in large doses

acts also as an antisialic, by lessening the blood-supply to the glands. Opium diminishes this secretion among many others, and also lessens the excitability of the reflex centre by which the secretion is largely stimulated. Others acting locally as sialagogues are Lime, Soda, Lithia, Magnesia, Borax, Potassium Chlorate, and insipid or nauseous articles of food or medicine.

Smell is rendered more acute by Strychnine, and is depressed by all the cerebral depressants, and by such agents as cause changes in the nasal mucous membrane, as Potassium Iodide.

Specifics are agents which have each a selective curative influence on a particular disease. *Mercury* is said to be specific to syphilis, *Quinine* to malaria, and other drugs are more or less specific to certain affections, but they have so many actions and uses that they are usually placed in other groups. The true specifics are the various Animal Extracts and Sera, though even these are being found remedial in other than their specific diseases. The most important of these agents are the *Thyroid* and *Supra-renal Glands*, and *Anti-diphtheric Serum* or *Diphtheria Antitoxin*, which are official; but many other Animal Extracts and Sera are used in medicine.

Stimulant (*stimulus*, a goad) is a term which is used in various senses when applied to medicinal agents. It is properly employed when used to designate the action of any agent which increases the functional activity of any part of the organism. Alcoholic preparations are commonly termed "stimulants," though their action is that of a true narcotic. *Diffusible Stimulants* are those which have a prompt but transient effect, as Ammonia, Camphor, Ether, etc. *Spinal Stimulants* exalt the functions of the spinal cord, as Strychnine; *Cerebral Stimulants* those of the brain, as Caffeine. We also have Cardiac, Vaso-motor, Renal, Stomachic, Hepatic, Intestinal, and Cutaneous Stimulants, and many others, according to the special seat of the action in each case.

Stomachics are gastric tonics, increasing the appetite and promoting the gastric digestion. Some act by stimulating the production of the gastric juice, among which are Alkalies before meals; others by stimulating the local circulation, as the Aromatic Oils, Alcohol, Ether, etc.; and several by exciting the activity of the nervo-muscular apparatus of the stomach, as Nux Vomica, Arsenic, Hydrastis, Aromatic Bitters, dilute Acids, etc. The various *Digestive-Ferments*, such as Pepsin,

Ingluvin, and dilute HCl Acid, are adjuvants to digestion, and are used to supplement the gastric juice when deficient in quantity or quality.

Styptics and **Hæmostatics** (*στυφω*, I contract; *αἷμα*, blood, *στένω*, a standing) are agents which arrest bleeding; *Styptics* being applied locally, and *Hæmostatics* administered internally, for the same purpose. Some act mechanically, by promoting clot-formation in the mouths of the bleeding vessels, others by causing the vessels themselves to contract, and thereby check the flow of blood. The principal members of this class are the following named, to wit:

Styptics, Acids, Alum, Ferric Chloride, Ferrous Sulphate, Zinc Sulphate, Lead Acetate, Silver Nitrate, Matico, Cold, Spider's Web, Tannic Acid and all the Vegetable Astringents.

Hæmostatics, the dilute Mineral Acids, especially Sulphuric, Gallic Acids, Ergot, Lead Acetate, Oil of Turpentine, and Hydrastis.

Taste is not heightened or lowered as a faculty by any drugs that we know of. Each substance makes its own peculiar impression on the nerve-organs of taste, and that of one agent may be so potent as to overcome the impression left by another agent. The so-called "after-taste" of drugs is often entirely different to their original taste, and substances which are excreted by the salivary glands (the Iodides, etc.), leave a very persistent after-taste behind them.

Uric Acid Eliminants include the Lithium salts, the Salicylates, Sodium Phosphate, and Hexamethylenamine (Urotropin); also several unofficial compounds, as Piperazin, Piperidin, Lycetol and Lysidin. They increase the solvent power of the urine for uric acid and the urates, and promote their excretion. This view is no longer held.

Urinary Acidifiers are few, comprising Acid Sodium Phosphate, Potassium Bitartrate, Benzoic Acid, Salicylic Acid, Salol, and Vegetable Acids in excess; also excess of proteids, sugar and starch, in the food, and certain wines and spirits. The Mineral Acids, being excreted as neutral sulphates, chlorides, phosphates, etc., have little or no influence on the acidity of the urine.

Urinary Alkalinizers, when taken internally, cause the urine to have an alkaline reaction. They include the *Alkalies*, especially alkaline salts of Potassium and Lithium, and the Citrates, but excepting Ammonia, which is broken up in the organism, and Sodium salts, which are not so efficient as other agents, being partly excreted by the bile and the bronchial

mucus, and partly locked up in the system as the neutral chloride, while the urate of sodium is insoluble.

Urinary Sedatives act in a sedative manner upon the whole extent of the urinary tract, through the medium of the urine, which, being charged with them, brings them into contact with the genito-urinary mucous membrane. Some of them may be applied locally as far as the urethral and vesical mucous surfaces, the portion above being inaccessible to direct local medication. They include Potassium and Lithium Salts to lessen acidity of the urine; Copaiba, Sabal, Cubeb and Oleum Santali as antiseptics and astringents, in cystitis and urethritis; also Eucalyptus and Zea for the same purpose; and urethral and vesical injections of solutions containing Boracic Acid, Alum, Lead and Zinc Acetates, Silver Nitrate, etc., agents which may also be applied to the urethra through the medium of gelatin pencils (Bougia) medicated with them.

Uterine Depressants lower the activity of the nervo-muscular apparatus controlling uterine contraction. The chief members of this group are: Opium, Cannabis, Bromides, Chloral, Chloroform, Tartar Emetic, Copper Sulphate, and all Emetics. *Viburnum prunifolium* is doubtfully considered a uterine sedative.

Uterine Tonics and Alteratives are remedies which are considered to have these actions upon the nutrition and functions of the uterus, concerning which there is much variance of opinion among authorities. The following list, however, contains those which are thought by some to have more or less value in uterine therapeutics, viz.:

Uterine Tonics

Pulsatilla.
Cimicifuga.
Iodine, and Astringents (locally).
Viburnum Opulus. *V. Prunifolium*.

Uterine Alteratives

Iodine. (locally).
Iodized Phenol (locally).
Glycerin. *Hydrastis* (locally).
Galvanism (locally).

Vascular Contractors are a group of agents which increase the contractile power of the arterioles, thereby lessening the capillary circulation, and raising the blood-pressure. They do this by a stimulating action upon either the vaso-motor centre or its mechanism in the walls of the vessels. Their most important uses are the checking of hemorrhages, and the cutting short of local inflammations. This group is well represented by Ergot, Digitalis, Cotarnine, and Adrenalin, the last-named being the

most powerful. Besides these it includes Atropine (small doses), Opium (small doses), Cocaine (locally), Hydrastinine (for the uterine vessels), Squill, Strychnine, Salts of Iron, Lead and Silver, Hamamelis, and Cold, applied locally, as by the Ether spray, or by evaporating lotions containing Alcohol, Vinegar, Ammonium Chloride, etc.

Vascular Dilators dilate the peripheral vessels, and increase the peripheral circulation, thus equalizing blood-pressure and preventing internal congestions. The most useful are Alcohol and Ether, as they stimulate the action of the heart simultaneously with the vascular relaxation. The other chief members of the group are Nitrites, Nitroglycerin, Nitrous Ether, Liquor Ammonii Acetatis, Opium with Ipecac (as in Dover's powder), and Heat, applied locally by poultices, etc.

The *Vascular Dilators* are often called *Vascular Stimulants* or stimulants of the circulation; but there is this difficulty in speaking of stimulants or sedatives of the circulation, that if both the heart and the vessels are stimulated at the same time, the action of the one tends to counteract that of the other. On the other hand, a drug which weakens the heart may increase the circulation by dilating the vessels, thus acting as a vascular stimulant (Brunton).

Vesical Sedatives lessen irritability of the bladder, decreasing the desire to micturate, and relieving vesical pain. The most important are Opium, Belladonna, Hyoscyamus, Cannabis, Calcium Carbonate, Zea, Sabal, Buchu, Uva Ursi, Pareira, Copaiba, and Cube; also Barley-water, Linseed tea, and other mucilaginous drinks.

Vesical Tonics increase the tone of the muscular fibres in the wall of the bladder, and consequently the contractile power of that organ. The chief members of this class are Strychnine, Belladonna, and the Bromides, all of which, carried to excess, will paralyze these same fibres by over-stimulation. This is particularly true of the Bromides.

Vision is affected by several drugs. The *Accommodation* is impaired or paralyzed by Atropine and its congeners, Cocaine, Gelsemine, Physostigmine, and Pilocarpine, acting on the ciliary muscle. *Ocular Sensibility* is increased by Strychnine, the vision being thereby rendered more acute, and the field of vision being enlarged. This drug also increases the field of vision for blue colors, while Physostigmine diminishes it for red and green, and Santonin causes objects to appear of a violet color at first, and of a greenish-yellow color afterward.

Amblyopia, or impairment of vision due to nerve changes, is often

produced temporarily by Quinine, and may be permanently induced by Alcohol and Tobacco, also by Lead and Urea poisoning.

Intraocular Tension is increased by Atropine, Hyoscyamine, etc., and is decreased by Physostigmine and by Cocaine. Gelsemine paralyzes the external ocular muscles, especially the levator palpebræ and external rectus, by its action on the terminal nerve filaments. [Compare MYDRIATICS and MYOTICS.]

Visions are caused by several drugs, the action of which is probably exerted on the sight-centres in the cerebrum (angular gyrus and occipital lobes), rather than on the eye itself. The delirium and hallucinations produced by *Alcohol* are familiar examples, the objects raised thereby being usually animals, as snakes, toads, dogs, etc. *Cannabis Indica* often causes pleasant visions, while *Sodium Salicylate*, in some persons, produced very disagreeable ones. The *Bromides*, if taken in continued large doses, may, in the typhoid condition which follows, cause visions of such intense character that they are often impressed permanently on a brain which, at the time, was utterly unconscious of all its real surroundings. *Digitalis* may produce subjective sensations of the continued presence of light, and *Cannabis Indica*, among the many curious effects produced by its ingestion in large doses, frequently gives origin to similar disturbances of the visual function, of indefinite and varied character.

RESTORATIVES

This division of the *Materia Medica* includes all agents which in any way promote the constructive metamorphosis of tissue, such as the Digestion-ferments, which aid digestion; the Foods, Tonics, Hæmatics or blood-restorers, and many substances generally known as Stimulants.

DIGESTION-FERMENTS

Digestion-ferments include the three animal products named Pepsin, Pancreatin and Inguvin, also Papain, from the vegetable kingdom.

Pepsin is an organic ferment which constitutes the digestive principle of the gastric juice of animals, and is usually obtained from the mucous membrane of the pig's stomach.

Pancreatin is a mixture of the enzymes naturally existing in the pancreas of warm-blooded animals, usually obtained from the fresh pancreas

of the hog. It contains ferments, viz., Trypsin, Amylopsin, and Steapsin.

**Ingluvin* is obtained from the gizzard of the domestic fowl, and owes its digestive activity to a peculiar bitter principle. Dose, gr. x-xxx.

**Papain*, *Papaw*, or *Papayotin*, is a ferment obtained from the milky juice of *Carica Papaya*, a South American fruit-tree. It is too powerful a digester to be used internally undiluted, as it might digest the gastric mucous membrane itself. Dose, gr. j-ijj.

Preparations. Only two are official.

Pepsinum, Pepsin, should digest not less than 3000 times its own weight of egg albumin. Dose, gr. ij-vj [av. gr. iv].

Pancreatinum, Pancreatin, should convert not less than 25 times its own weight of starch into substances soluble in water. Dose, gr. v-x [av. gr. vijss].

**Pepsinum Saccharatum*, Saccharated Pepsin, is Pepsin triturated with 9 of Sugar of Milk. Dose, gr. v-xxx, after meals.

**Liquor Pepsini*, Solution of Pepsin, Liquid Pepsin, has of the preceding 40 parts, with HCl 12, Glycerin 400, in Water to 1000. Dose, ʒj-ʒij.

Every manufacturer of digestion-ferments has his own preparation of Pepsin and Pancreatin, and his peculiar name therefor. These various products vary considerably in their properties. A few of the most prominent are:

**Jensen's Crystal Pepsin*, in yellowish, translucent scales, soluble in water, and claimed to be pure pepsin without admixture. Dose, gr. j-ijj.

**Pepsine in Scales* (Fairchild) is a similar preparation, gr. j of which is claimed to digest 1000 grains of albumin in 4 hours. Dose, gr. j-ijj.

**Essence of Pepsine*, a solution similar to the Liquor. Dose, ʒj-ij.

**Pancreatin*, besides the official form, is marketed in various preparations, Pancreatic Emulsion, Liquor Pancreaticus etc., and is also put up with three times its weight of Sodium Bicarbonate, as "Peptonic Milk Powder" or "Peptonizing Tubes," for the preparation of Peptonized Milk.

**Diastasic Essence of Pancreas*, for starchy foods. Dose, ʒj-ij.

**Trypsin*, the fibrin-digesting ferment of the pancreatic juice. Is used in aqueous solution, ʒss to the ʒ, with gr. x of Sodium Bicarb., locally.

Scheffer's Process is the standard process for the preparation of Pepsin. The mucous membrane of a pig's stomach is scraped off and digested in a solution of HCl, and the Pepsin is then precipitated by add-

ing a solution of NaCl. Ten grains of Scheffer's ~~33~~ Chararated Pepsin, with gtt. x of dilute HCl, and ʒj of water, will dissolve 200 grains of albumin in from 5 to 6 hours, at 100°F.

Incompatibles.—Alkalies and many mineral salts precipitate pepsin. Alcohol destroys its activity. Alkalies promote the action of pancreatin. Pepsin and pancreatin are incompatible as one would digest the other.

Physiological Action.—*Pepsin* and *Ingluvin* digest the nitrogenous principles of the food (albumin, casein, fibrin, etc.) converting them into peptones for assimilation, in which they are materially aided by Lactic and HCl Acids. *Pancreatin* digests albuminoids, converting proteids into peptones, changes starch into sugar, and emulsifies fats and oils in the presence of an alkali. It is digested by pepsin, which is an essential constituent of the gastric juice, and therefore it probably never passes into the duodenum in its own character. *Trypsin*, unlike Pepsin, will dissolve mucin, and like Pepsin it is inert toward nuclein, horn and amyloid matter.

Therapeutics.—*Pepsin* is used in atonic dyspepsia, the apepsia of infants, gastralgia, anæmia, chlorosis, gastric ulcer and cancer, diarrhœa of infants, and the vomiting of pregnancy. It is injected into the substance of morbid growths which are homologous to the tissues, for their destruction, especially fatty tumors. *Ingluvin* is sometimes useful against vomiting, and has been found efficient in the vomiting of pregnancy. *Pancreatin* is used to assist the digestion of oils and fats, and should be administered 2 or 3 hours after meals; while Pepsin is best given near meal time. The various Pancreatic preparations are used to partially digest (peptonize) milk, gruel, soups and other foods, before administration, in cases where there is great digestive debility. These peptonized foods may be administered by rectal injection (enemata) the rectum not being a digestive organ, as well as by the mouth, and are invaluable in wasting diseases, in intestinal dyspepsia, and in convalescence from acute affections. There is much doubt, however, about the value of pancreatin except as a *predigestant*, as pancreatin in the stomach would be digested by the pepsin. *Trypsin* is used with real benefit as a solvent of the diphtheritic membrane, but requires to be thoroughly and frequently applied. *Papain* is a powerful digester of fibrin, acting in solutions of any reaction, and at higher temperatures than Pepsin will. It is a rapid solvent of false membranes and of intestinal worms. It has been injected into tumors for their destruction, and successfully, but with much pain

and considerable febrile reaction. It is used internally under the name Papoid, in doses of gr. j-ijj. We have no evidence that there is ever a deficiency of pepsin.

ACIDUM LACTICUM—Lactic Acid

Properties of Lactic Acid.—It is a liquid organic acid, of specific gravity 1.206, and difficult to obtain pure. It should be given in quantity to render water distinctly sour, and always well diluted. It is found in the stomach, being a product of the food, and combines with bases in the blood, forming lactates, which being oxidized are converted into carbonates. Dose, ℥x-xlv [av. ℥xxx], well diluted.

Physiological Action.—It aids digestion, and promotes the appetite; in large doses causing flatulence and much epigastric pain. Injected into the peritoneal cavity of animals, it excites endocarditis, and given in diabetes it has caused acute rheumatism and rheumatic endocarditis. Hence its supposed causation of acute rheumatism, when in excess and free in the blood.

Therapeutics.—It is used in atonic dyspepsia, oxaluria, and in the lithic and phosphatic diatheses when due to imperfect digestion and assimilation. As a solvent of false membrane in croup and diphtheria, it is unquestionably of great service, but is difficult of application, as in a solution of sufficient strength to act upon the membrane it causes considerable smarting pain. In chronic cystitis it arrests ammoniacal decomposition of the urine.

MINERAL ACIDS

Preparations of the Mineral Acids.

Acidum Sulphuricum Dilutum, Diluted Sulphuric Acid, is a 10 per cent. aqueous solution of the absolute acid. Dose, ℥v-xl [av. ℥xxx], well diluted.

Acidum Sulphuricum Aromaticum, Aromatic Sulphuric Acid (Elixir of Vitriol), contains 20 per cent. of the absolute acid, chiefly in the form of ethyl-sulphuric acid, also alcohol, ginger, and cinnamon. It is not an acid, but rather an ether, formed by the action of the acid on the alcohol. Dose, ℥v-xx [av. ℥xv], well diluted.

Acidum Hydrochloricum Dilutum, Diluted Hydrochloric Acid, is a 10 per cent. aqueous solution. Dose, ℥ij-xx [av. ℥xv], well diluted.

Acidum Nitricum Dilutum, Diluted Nitric Acid, is a 10 per cent. aqueous solution. Dose $\text{Mij}-\text{xl}$ [av. Mxxx], well diluted.

Acidum Nitrohydrochloricum Dilutum, Diluted Nitrohydrochloric Acid, has of Nitric Acid, 4, Hydrochloric acid 18.2, Distilled Water 78. Dose, $\text{Mv}-\text{xx}$ [av. Mxv], well diluted.

Acidum Phosphoricum Dilutum, Diluted Phosphoric Acid, is a 10 per cent. aqueous solution of Orthophosphoric Acid. Dose, $\text{Mv}-\text{xl}$ [av. Mxxx], well diluted.

Physiological Action.—The strong mineral acids are escharotics, abstracting the water from the tissues, combining with the bases, destroying the protoplasm, and are very diffusible. Sulphuric carbonizes (black); Nitric tans (yellow). The dilute acids act in the stomach chemically. Secretion is promoted by Nitric, lessened by Sulphuric, Hydrochloric acid acting thereon between the other two. Applied to the mouths of ducts from glands having an acid secretion, they are believed to check the latter; to those of glands having an alkaline secretion they are thought to promote it (e.g., bile, pancreatic juice, etc.). Fermentation is checked by the mineral acids. Bowels are constipated by Sulphuric (relaxed by Nitric) acid.

As these agents are synergistic to pepsin, they at first aid digestion; but if continued they lessen the production of gastric juice, and so impair digestion. Given before meals in small doses they may relieve excessive acidity of the stomach, by checking the production of the acid gastric juice (?).

Poisoning by Mineral Acids is treated by Alkalies, as washing soda, soap-suds, etc., to neutralize the acid; cautiously empty the stomach; give oil, albumin, or milk, to protect the mucous membrane. Stimulants, Opium, Ammonia intravenously, to combat the resulting depressed condition of the vital powers.

Therapeutics.—The Mineral Acids are used in:

Atonic Dyspepsia, small doses of Hydrochloric Acid with Pepsin, given after meals.

Acidity, Hydrochloric or Phosphoric Acids in small doses before meals.

Oxaluria, Nitric or Nitrohydrochloric Acid. *Lithæmia*, Nitric Acid.

Diarrhæa, when profuse secretions, Sulphuric Acid with Opium.

Choleraic Diarrhæa and Dysentery, Sulphuric Acid with Opium, or with Magnesium Sulphate, is found very serviceable.

Lead Poisoning, Sulphuric Acid, to form the insoluble sulphate of lead.

Hemorrhoids, Sulphuric Acid; also for hemorrhage from lower bowel.

Hemorrhages, Sulphuric Acid is undoubtedly effective in uterine hemorrhage from fibroids, and in other hemorrhages at points distant from the stomach; also sometimes in purpura hæmorrhagica.

Chronic Hepatic Disorders, Nitro-hydrochloric Acid in all forms of liver affections due to malaria, internally, and locally as a bath.

Aphonia of Singers, Dilute Nitric Acid in 10-drop doses.

Phthisis, Aromatic Sulphuric Acid for the sweats.

Local Uses.—They are employed against:

Ulcers, Fuming Nitric Acid as an escharotic also in *Gangrene*.

Hemorrhoids, of the bleeding, strawberry-pile kind, Fuming Nitric Acid.

Diseased Joints, Counterirritation by Brodie's liniment, composed of Sulphuric Acid one-fourth, Olive Oil three-fourths.

OILS AND FATS

Fixed Oil and Fats used in Medicine are as follows:

Adeps, Lard.

Adeps Benzoinatus, Benzoinated Lard.

Adeps Lana, Wool-fat.

Adeps Lana Hydrosus, Hydrous Wool-fat (Lanolin).

Serum Præparatum, Prepared Suet.

Celaceum, Spermaceti.

Oleum Adipis, Lard Oil.

Ol. Amygdala Expressum, Almond Oil.

Ol. Gossypii Seminis, Cotton-seed Oil.

Oleum Lini, Linseed (Flax-seed) Oil.

Oleum Morrhua, Cod-liver Oil.

Oleum Oliva, Olive Oil.

Oleum Theobromatis, Oil of Theobroma (Cacao-butter).

Two other official fixed oils, *Oleum Ricini* and *Oleum Tigllii*, are used for their cathartic qualities, and are therefore classed with the Evacuants.

Derivative and Preparations.

Glycerinum, Glycerin, Glycerol, is a liquid obtained by the decomposition of fats or fixed oils, containing not less than 95 per cent. of *Glycerol*, a triatomic alcohol. Glycerin is very hygroscopic, soluble in water or alcohol, and dissolves Tannic and Gallic Acids, Bromine, Iodine, Phenol, etc. Dose, ʒj-ij [av. ʒj] diluted.

Suppositoria Glycerini, Suppositories of Glycerin, each contains 46 grains of Glycerin. They are used per rectum for constipation.

**Cataplasma Kaolini*, Cataplasm of Kaolin, contains 37½ per cent. of Glycerin, the active agent, with a base of Kaolin, also Boric Acid, Thymol, Methyl Salicylate, and Oil of Peppermint. It is similar

to the proprietary preparation Antiphlogistine, and is of less value than a bread and milk poultice.

**Unna's Paint* has 10 per cent. of Glycerin, with Gelatin, Zinc Oxide, and Water and resembles white rubber in appearance.

Composition.—All the fixed oils (except Cod-liver Oil) contain olein, stearin, and margarin, in varying proportions, the olein giving fluidity, the stearin solidity. Olein, Stearin, and Margarin are respectively oleate, stearate, and margarate of Glycerin. *Cod-liver Oil* consists chiefly of olein and margarin, with a peculiar principle, Gaduin, also propylamin, bile constituents, and traces of sulphuric and phosphoric acids, bromine, iodine, phosphorus, iron, lime and magnesia. Three kinds are sold, the pale, the light-brown, and the dark. The pale oil is considered to be the purest. *Linseed Oil* contains much vegetable albumin, which coagulates on exposure to the air, making it a drying oil. Its olein furnishes linoleic acid, instead of oleic, when saponified. *Adeps Lana* is a cholesterin fat obtained from the washings of sheep's wool. The Hydrous form is known by the trade name *Lanolin*, contains 25 to 30 per cent. of water, and unites readily with 110 per cent. of its own weight of water. It differs from all other fats, in resisting saponification, the action of water, and the tendency to rancidity. It is perfectly neutral as a base, and readily penetrates the integument, carrying with it any medicament it is charged with. *Cotton-seed Oil* is used largely in place of Olive Oil, and was at one time sold as Olive Oil in the shops. Hence it was made official, and its use directed for certain pharmacopœial preparations.

Physiological Action.—Fats in small quantity are necessary to the digestion of nitrogenous food (Lehmann), and form the molecular basis of the chyle. They are prepared for absorption by the pancreatic juice and the bile, especially by the latter. Fat is an essential constituent of the products of tissue formation, whether physiological or pathological, and is the chief material concerned in the formation of energy. After oxidation it is excreted as carbon dioxide and water. Locally applied fats reduce the body temperature.

Glycerin abstracts water from tissues with which it comes into contact, and unless pure is often very irritating to the skin. It is freely absorbed by the cutaneous and mucous surfaces, and is decomposed in the system, passing out as formic and other acids. On the stomach it has no particular action, but in large quantities it is laxative and is said to cause

the solution of the red blood corpuscles and hæmoglobinuria. The urine of persons using glycerin contains a body which acts like sugar in the copper and fermentation tests, but is not sugar. Glycerin is a good emollient and is considered nutritive by many authorities.

Therapeutics.—Locally, by inunction, oils and fats may be used in the scaly diseases of the skin, and in chronic wasting diseases; also in rickety and scrofulous children, and in febrile disorders, particularly the desquamative stage of scarlatina. *Cod-liver Oil*, once used extensively, has now been supplanted by olive oil and cream for use in the following diseases; viz.:

| | |
|-----------------------------------|----------------------------------|
| Chronic Forms of Phthisis. | Strumous Skin diseases. |
| Chronic Bronchitis and Emphysema. | Syphilo-dermata. |
| Chronic Rheumatic Disorders. | Neuralgia, Chorea, Epilepsy. |
| Atheroma of the Arteries. | Diarrhoeas of strumous subjects. |

Cod-liver Oil, if used, is best administered in small doses, a teaspoonful thrice a day for an adult, in black coffee, beer or lemon-juice. One drop of the Essential Oil of Eucalyptus will extinguish the odor and taste of too drops.

Unna's Paint and its imitations, the Cataplasm of Kaolin, and Anti-phlogistine, are questionable applications for inflammatory conditions of the skin, muscles and joints; also in pneumonia, pleurisy, peritonitis, acute rheumatism, chronic ulcers, sprains, and eczema with induration. The glycerin constituent has a dehydrating effect on the tissues, relieving tension and its consequent pain; and in deep-seated inflammations it may cause a superficial hyperæmia which tends to decrease the congestion of the affected part.

PHOSPHORUS

Preparations.—Only one is official, viz.:

Pilula Phosphori, Pills of Phosphorus, each contains gr. $\frac{1}{100}$ of Phosphorus, which is the average adult dose.

**Elixir Phosphori*, Elixir of Phosphorus, each 3 contains gr. $\frac{1}{65}$ of Phosphorus. Dose, 3ss-iv.

Physiological Action.—Phosphorus in *small doses* is a stimulant to the growth of the bones, to the genital function, and to the brain, circulation and stomach. It aids digestion by irritating the end-organs of the stomach nerves, and causes eructations of hydrogen phosphide. Its fumes cause necrosis of the upper or lower jaw bones, especially in those

whose teeth are decayed; but this may be prevented by the inhalation of the fumes of old acid turpentine. (?) In *poisonous doses* it is a powerful gastro-intestinal irritant, causing vomiting and purging, with great depression; reaching the blood as phosphorus it destroys the red corpuscles, causing acute hemorrhages from fatty degeneration of the arterial walls, rapid steatosis of the stomach, liver and heart, with deep jaundice; then delirium, convulsions, coma and death, generally from gradual failure of both respiration and circulation.

Antidotes.—Copper Sulphate is the best emetic (forming a nearly insoluble phosphide of copper), 3-grain doses in dilute solution every 5 minutes until emesis. Hydrated Magnesia as a quickly acting purgative. Lime-water or Charcoal to prevent its action on the tissues. The antidote is the common commercial *Oil of Turpentine* (Bartholow), crude French Acid Turpentine (Wood), which has been exposed to the air for some time. Transfusion has been efficacious in repairing the blood. No oils or fats, as they dissolve phosphorus and promote its absorption.

Acute Phosphorus Poisoning most resembles Acute Yellow Atrophy of the Liver; so much so that it is generally impossible to distinguish between them.

Therapeutics.—Phosphorus is used in:

Chronic Nervous Exhaustion, when the nerve centres are implicated.

Neuralgia requires large doses, gr. $\frac{1}{2}$ or 3v of the Elixir.

Anæmia, pernicious anæmia, and their results; small doses.

Wakefulness of the aged, and that from cerebral anæmia; small doses.

Impotence, of functional character; no remedy more efficient.

Progressive Locomotor Ataxia is decidedly ameliorated by Phosphorus.

Skin Diseases; as a substitute for Arsenic in acne, psoriasis and lupus.

Paraplegia, of myelitic origin, from excessive venery. (?)

Osteomalacia and Rachitis are much benefited by Phosphorus.

Threatened Cerebral Softening, in which no other drug seems to affect the nerve centres as beneficially as Phosphorus does.

PHOSPHATES AND PHOSPHITES

Salts and their Preparations.

**Calcii Phosphas Precipitatus*, Precipitated Calcium Phosphate. Dose, gr. v-xxx [av. gr. xv].

Syrupus Calcii Lactophosphatis, Syrup of Calcium Lactophosphate.

Dose, ʒj-iv [av. ʒij].

Sodii Phosphas, Sodium Phosphate. Dose, gr. x-ʒj [av. gr. xxx].

Sodii Phosphas Effervescens, Effervescent Sodium Phosphate. Dose, ʒj-iv [av. ʒij].

**Liquor Sodii Phosphatis Compositus*, Compound Solution of Sodium Phosphate. Dose, ʒj-iv [av. ʒij].

**Sodii Pyrophosphas*, Sodium Pyrophosphate. Dose, gr. x-ʒj [av. gr. xxx].

**Syrupus Ferri, Quininae, et Strychninae Phosphatum*, Syrup of the Phosphates of Iron, Quinine and Strychnine. Dose, ʒss-ij [av. ʒj].

Syrupus Hypophosphitum, Syrup of Hypophosphites. Dose, ʒj-iv [av. ʒij].

**Syrupus Hypophosphitum Compositus*, Compound Syrup of Hypophosphites. Dose, ʒj-iv [av. ʒij].

Physiological Action.—*Calcium Phosphate* is an essential ingredient of the tissues, forming more than 50 per cent. of the bones. Lactic and HCl Acids dissolve it in small quantities. It increases the alkalinity of the blood and its power to hold carbon dioxide, and diminishes the excretion of urea. *Sodium Phosphate* acts similarly on the blood and urea, and increases excretion, especially that of the bile, being an excellent cholagogue, and thereby aiding the digestion of fats (?). In ounce doses it is laxative.

Therapeutics.—*Calcium Phosphate* may be used with advantage in all diseases of mal-nutrition, and where repair or development of the bones is required. It is useful in:

Osteo-malacia.

Protracted Suppuration.

Rachitis.

Caries.

Scrofulosis.

Phthisis.

Anæmia and Bone Soften-

ing of Lactation.

Sodium Phosphate, in ʒ doses *ter die* for adults, gr. x-xx for children, is extremely useful in conditions depending on catarrh of the bile ducts and duodenum, as headache, jaundice, chalky stools, etc. Gall-stones may be prevented from forming by scruple or drachm doses of this salt before meals, for months (?). It is also a good remedy for the following conditions:

Obesity.

Incipient Hepatic Sclerosis.

Pasty white stools of ill-conditioned children.

Chronic Infantile Diarrhoea. Biliary Sick-headache.

Cerebral Debility.

FERRUM—Iron

Chief Preparations of Iron.

Ferri Phosphate, Ferric phosphate. Average dose, gr. iv.

Ferri Carbonas Saccharatus, Saccharated Ferrous Carbonate. Dose, gr. j-x [av. gr. iv]. *Massa Ferri Carbonatis*, Mass of Ferrous Carbonate. Dose, gr. j-x [av. gr. iv], after food.

Tinctura Ferri Chloridi, Tincture of Ferric Chloride, contains about 13 per cent. of the anhydrous salt, with some free HCl. Dose, ℥v-xx [av. ℥vii] well diluted.

Liquor Ferri et Ammonii Acetatis, Solution of Iron and Ammonium Acetate (Basham's Mixture). Dose, ℥j-vj [av. ℥iv], well diluted.

Ferri Sulphas Exiccatus, Dried Ferrous Sulphate, gr. ss-ij [av. gr. ij].

Liquor Ferri Subsulphatis, Solution of Ferric Subsulphate (Monsel's Solution), chiefly used as a styptic. Dose, ℥j-x [av. ℥iij], well diluted.

Syrupus Ferri Iodidi, Syrup of Ferrous Iodide. Dose, ℥v-xl [av. ℥xv], well diluted and taken through a quill or a glass tube.

Ferri Hydroxidum cum Magnesii Oxido, Ferric Hydroxide with Magnesium Oxide. Dose as an antidote for Arsenic, ℥ij-vj [av. ℥iv].

**Ferri Citras*, Citrate of Iron. Dose, gr. iv.

**Ferri et Strychninae Citras*, Citrate of Iron and Strychnine. A scale preparation, readily soluble in water, contains about 1 per cent. of Strychnine, and about 16 per cent. of Iron. Dose, gr. ij.

Incompatibles are Acids, Acidulous salts, Alkalies and their Carbonates, Tannic and Gallic Acids and all Vegetable Astringents, hence the Bitters, except Calumba, Quassia, Chiretta, and Gentian, which contain no tannin. The Tincture of the Chloride is decomposed by the Alkalies, Alkaline earths and their Carbonates, Astringent Vegetable infusions, and Mucilage of Acacia.

Physiological Action.—Iron is present in the blood (1 part to 230 of red corpuscles), also in the bile, lymph, gastric juice, etc. Given medicinally, in small doses, it improves the blood, increasing the number of the red corpuscles, and promoting the appetite and digestion. In large doses, nausea and vomiting are produced by the soluble preparations. The Iodide, Chloride, Nitrate and Sulphate are active irritant poisons, are more or less astringent, and act injuriously on the teeth. Only a small portion is absorbed, the rest being eliminated by the intestinal canal. The Tincture of the Chloride was formerly thought one of the most valu-

able compounds of Iron, but the milder preparations, like the Carbonate and the Citrates, have been found as efficient and do not possess the strong astringent action of the Chloride nor its destructive action on tooth enamel.

Therapeutics.—The chief indication for Iron is anæmia; when plethora exists it is contra-indicated. It should be given after meals, and occasionally suspended for a time, to avoid deranging the digestion.

Pseudo-leucocythæmia is much benefited by chalybeates, with arsenic.

Syphilitic Cachexia is greatly influenced by the Iodide of Iron.

Acute Rheumatism, in anæmic subjects only; in them highly useful.

Chorea, of anæmic girls, about the age of puberty, with purgatives.

Cardiac Disorders, fatty heart, weak heart, dilatation, mitral disease.

Nocturnal Incontinence of Urine in delicate children, the Syrup of the

Iodide, ℞xv-xx *ter die*, has given excellent results.

Menstrual Disorders, due to anæmia, especially amenorrhœa.

Hemorrhages, of every form, Monsel's Solution, locally.

Erysipelas, half-drachm doses of the Tinct. Ferri Chlor. every 4 hours in very many cases controls the disease; how is not known (?).

MANGANUM—Manganese

Mangani Dioxidum Præcipitatum, Precipitated Manganese Dioxide, is prepared from the sulphate. Dose, gr. j-x [av. gr. iv], in pill.

**Mangani Hypophosphis*, Manganese Hypophosphite, a constituent of the Compound Syrup of Hypophosphites. Dose, gr. j-vj [av. gr. iiij].

**Mangani Sulphas*, Manganese Sulphate, is freely soluble in water, and of bad taste. Dose, gr. ij-vj [av. gr. iv].

Potassii Permanganas, Potassium Permanganate, should not be triturated nor combined in solution with organic or readily oxidizable substances. Dose, gr. ss-ij [av. gr. j], in pill or distilled water.

Physiological Action.—The salts of Manganese in small doses have little or no effect, but a cumulative effect ending in paraplegia results from chronic poisoning. In larger doses they lower the heart's action, paralyze the muscular system, especially the muscular coat of the arteries, causing progressive wasting, paraplegia, and acute fatty degeneration of the liver. They are gastro-intestinal irritants, and may have some excitant action on the uterus. Manganese is closely associated with Iron in the blood, in the proportion of about 1 to 20, but its presence is adventitious rather than essential.

Therapeutics.—Manganese is prescribed in:

Anæmia and Chlorosis, though it probably is of no benefit.

Chronic Skin Diseases, the Dioxide as an ointment.

Amenorrhœa, and other menstrual derangements, the Dioxide, in freshly made pills of 2 grains each, of which 1-5 pills thrice daily.

Uses of Potassium Permanganate.—As an antiseptic and oxidizing agent (1 in 2000 of distilled water) it is used in diphtheria, scarlatina, septicæmia, etc. Locally it is employed as a deodorizer in cancer, ozæna, otorrhœa, foul breath, and fetid perspiration of the feet, in solution of ʒj to the pint. It is employed in amenorrhœa, and other derangements of the menstrual function, but on insufficient grounds. When used internally it must be decomposed in the stomach, and cannot be absorbed in its own form. It has come into prominence as an antidote to Morphine in the stomach, but is not as efficacious as lavage.

BISMUTHUM—Bismuth

Bismuthi Subcarbonas, Bismuth Subcarbonate. Dose, gr. v-xxx [av. gr. viijss].

Bismuthi Subnitras, Bismuth Subnitrate. Dose, gr. v-xxx [av. gr. viijss].

Both these salts are heavy, white powders, insoluble in water or alcohol, and so nearly insoluble in the gastric juice, that larger doses may be safely given if uncontaminated with Arsenic. They are administered in plowder, emulsion, troche, or simply stirred up in milk.

Bismuthi Subgallas, Bismuth Subgallate, should yield 52 to 57 per cent. of pure bismuth oxide. Dose, gr. j-x [av. gr. iv].

Bismuthi Subsalcylas, Bismuth Subsalcylate, should yield 62 to 64 per cent. of pure bismuth oxide. Dose, gr. j-x [av. gr. iv.]

Bismuthi Betanaphtholas, Bismuth Betanaphthol. [Av. dose, gr. viii.]

Bismuthi et Ammonii Citras, Bismuth and Ammonium Citrate, small, shining scales, very soluble in water. Dose, gr. j-v [av. gr. ij].

**Bismuthi Subiodidum*, Bismuth Subiodide, a heavy, dark red, impalpable powder, insoluble, stains fabrics deeply. Not used internally.

Physiological Action of the insoluble salts of Bismuth is chiefly that of a local sedative and astringent. After a time these salts produce constipation, and always give to the stool and tongue a dark clay color, by reason of their conversion in part to a sulphide in the gastro-intestinal canal. Toxic effects, when occurring, are generally due to the presence

of Arsenic, with which most of the commercial preparations are contaminated. Poisonous effects have, however, been observed from their absorption when freely used upon a large wound.

The soluble salts (Citrate, etc.), when given in large doses, have an action like that of Mercury, Antimony or Arsenic, producing severe gastro-enteritis, fatty degeneration of the liver, etc. The *Subiodide* has an energetic antiseptic and stimulant action upon wounds, ulcers, etc., promoting the growth of granulation tissue, and preventing the formation of pus.

Therapeutics.—The Subcarbonate and Subnitrate are given internally in most forms of disordered digestion, vomiting, and diarrhoea, but large doses are necessary. The best vehicle for them is milk. They are used in:

| | | |
|----------------------------|--------------------------|----------------------------|
| Acute Gastritis. | Vomiting of Children. | Diarrhoea of typhoid fever |
| Gastralgia, Gastric Ulcer. | Vomiting of Pregnancy. | and phthisis. |
| Acute Indigestion. | Gastro-intestinal Disor- | Chronic Diarrhoea. |
| Aphthæ, and Stomatitis. | ders of Children. | |

Locally, these salts may be applied with advantage in cases of:

| | | |
|---------------------|-------------|-----------------|
| Stomatitis. | Eczema. | Conjunctivitis. |
| Nursing Sore Mouth. | Intertrigo. | Leucorrhœa. |
| Acne Rosacea. | | |

As a dressing for wounds, ulcers, etc., where an antiseptic and stimulating action is desired, the *Subiodide* may be freely dusted on to the surface after it has been washed and dried.

ARSENUM—Arsenic

Salts and their Preparations.

Arseni Trioxidum, Arsenic Trioxide (White Arsenic) As_2O_3 , a heavy solid, occurring as a white powder, or in transparent masses like glass, or in op que masses like porcelain; odorless and tasteless, soluble in water, 1 in 30 to 100, according to its physical condition. Dose, gr. $\frac{1}{50}$ – $\frac{1}{10}$ [av. gr. $\frac{1}{80}$] after meals.

Liquor Acidi Arsenosi, Solution of Arsenous Acid (Solution of Chloride of Arsenic), strength $\frac{1}{100}$. Dose, $\mathfrak{m}\jmath$ – \mathfrak{x} [av. $\mathfrak{m}\mathfrak{i}\mathfrak{j}$], after meals.

Liquor Potassii Arseniitis, Solution of Potassium Arsenite (Fowler's Solution), strength $\frac{1}{100}$. Dose, $\mathfrak{m}\jmath$ – $\mathfrak{i}\mathfrak{j}$ [av. $\mathfrak{m}\mathfrak{i}\mathfrak{j}$], after meals.

Liquor Sodii Arsenatis, Solution of Sodium Arsenate (Pearson's Solution), strength $\frac{1}{100}$. Dose, $\mathfrak{Mj}-x$ [av. \mathfrak{Mij}], after meals.

Arseni Iodidum, Arsenic Iodide, should contain about 16 per cent. of metallic Arsenic; is soluble in 12 of water. Dose, gr. $\frac{1}{20}-\frac{1}{6}$ [av. gr. $\frac{1}{12}$], after meals.

Liquor Arseni et Hydrargyri Iodidi, Solution of Arsenic and Mercuric Iodide (Donovan's Solution), strength $\frac{1}{100}$. Dose, $\mathfrak{Mj}-v$ [av. \mathfrak{Mjss}], after meals.

Paradiamidodioxy Arsenobenzolum Hydrochloride, Salvarsan, 606, is about 35 per cent. Arsenic. Dose, gr. x .

Toxicology.—Arsenical poisoning was formerly treated by administering a freshly prepared solution of Hydroxide of Iron and Magnesium Oxide, but experiments on animals prove this method to be useless. Reliance must be placed on copious gastric lavage frequently repeated, as the poison is not freely soluble. An emetic may well precede the lavage. Warmth, caffeine and digitalis may be used to combat the collapse.

Chronic Arsenical Poisoning with paralysis may be treated with the galvanic current, with other suitable eliminative measures. Unless very small doses are used, Arsenic should always be given just after meals, so as to avoid its irritant action on the gastric mucous membrane.

Physiological Action.—Arsenic is a very painful escharotic, exciting violent inflammation. Taken internally it is a powerful irritant to the gastro-intestinal and bronchial mucous membrane.

In Small Doses, Arsenic stimulates the blood-forming organs, reduces relative alkalinity of the blood, tends to inhibit the glycogenic function of the liver, and tends to bring on fatty infiltrations. When tolerance is established, large doses are taken with impunity, as by the arsenic-eaters of Styria.

In Full Medicinal Doses continued, it produces cedema and itching of the eyelids, increased saliva, nausea, vomiting and mucus, diarrhoea or dysentery, epigastric pain and soreness, irritable and feeble heart, disordered sensibility, herpes zoster, urticaria, eczema and other skin eruptions, jaundice and albuminuria.

In Toxic Doses, the phenomena may be either gastro-intestinal or profoundly cerebral in character. In the first and most usual form, there is burning pain at the stomach, extending over the abdomen, vomiting, thirst, bloody stools, strangury, suppressed or bloody urine, a rapid and feeble heart, great anxiety, cold breath, albuminuria, col-

lapse. In the nervous form, profound coma, like that of opium narcosis, comes on suddenly, and without any gastro-intestinal symptoms.

Post-mortem shows erosions, ecchymoses, and softening of the gastro-intestinal mucous membrane, congestion of the lungs and the bronchial mucous membrane, fatty degeneration of the internal organs, especially the liver and kidneys.

Therapeutics.—Arsenic is very useful in:

Stomach Disorders, as chronic gastric catarrh, irritative dyspepsia, chronic gastric ulcer, cancer of the stomach, gastralgia, and vomiting due to these affections. Very small doses here, gtt. j of Fowler's solution.

Trypanosomiasis, using Fowler's Solution and Sodium Arsenate alternately.

Tertiary Syphilis has recently been treated with much success, and some fatalities, by the use of Salvarsan.

Diarrhæas and Dysentery, chronic and choleraic.

Liver Disorders, of malarial origin, and catarrhal jaundice.

Anæmia and Chlorosis, to promote constructive metamorphosis.

Vomiting of Pregnancy, gtt. j of Fowler's solution before each meal.

Weak Heart, with dyspnoea and œdema of the feet and ankles resulting therefrom, Arsenic with Iron and Strychnine.

Chorea, large doses, Mij of Fowler's solution thrice daily, are very useful.

Malaria is well treated by Arsenic as an adjunct to Quinine.

Epithelioma, and many other forms of cancer, are retarded by Arsenic.

Chronic Skin Diseases, particularly psoriasis, and eczema squamosum, and those affecting the superficial strata of the integument.

Rheumatoid Arthritis has been well treated with Arsenic.

Locally, Arsenical paste is used as an escharotic in cancer, but is excessively painful. It is a good depilatory.

BITTERS

Bitters are divided into the Simple Bitters and the Aromatic Bitters. The latter contain Gallic and Tannic acids, besides aromatic constituents; and are, therefore, more or less astringent. There are also certain special bitters, Eucalyptus, Hydrastis, Cinchona, etc., which will be treated of separately.

SIMPLE BITTERS

Quassia, the wood of *Picrasma excelsa* or of *Quassia amara*. Active principle, Quassin. Dose, gr. v–xv [av. gr. vijss].

Tincture Quassia, Tincture of Quassia, ℞–℥j [av. ℞xxx].

Gentiana, Gentian, the root of *Gentiana lutea*. Composition, Gentianin, Gentestic Acid. Dose, gr. x–xx [av. gr. xv].

Fluidextractum Gentianæ, Fluidextract of G. Dose, ℞x–xxx [av. ℞xv].

Tinctura Gentianæ Composita, Compound Tincture of Gentian, contains Gentian 10, Bitter Orange Peel 4, Cardamom 1, Alcohol and Water to 100. Dose, ℥ss–ij [av. ℥j].

**Mistura Gentianæ et Sennæ*, has of Infusum Sennæ ℥iij, Tinct. Cardamomi Co. ℥j, Infusum Gentianæ Co. ℥vj. One dose.

Calumba, Calumba, the root of *Jateorrhiza palmata*. Composition, Berberine, Calumbin, Calumbic Acid and Starch, but no Tannin.

**Fluidextractum Calumbæ*, Fluidext. of C. Dose, ℞v–xlx [av. ℞xxx].

Tinctura Calumbæ, Tincture of Calumba. Dose, ℥ss–ij [av. ℥j].

AROMATIC BITTERS

Serpentaria, Virginia Snake-root, described under Cardiac Stimulants.

Prunus Virginiana, Wild Cherry, the bark of *Prunus serotina*. Composition, Amygdalin and Emulsin (which by their mutual reaction with water produce Hydrocyanic Acid), Tannic and Gallic Acids, etc.

**Fluidextractum Pruni Virginianæ*. Dose, ℞xx–xl [av. ℞xxx].

**Infusum Pruni Virginianæ*, 4 per cent. Dose, ℥ss–iij [av. ℥ij].

Syrupus Pruni Virginianæ, 15 per cent. Dose, ℥ss–jss [av. ℥j].

Physiological Action.—The Simple Bitters increase appetite and aid digestion, thus promoting the constructive metamorphosis. They increase the mucous secretion, the flow of saliva and of gastric juice. They act by augmenting the gustatory-gastric psychical reflex. As they also increase the gastric mucus, their continued use will set up gastric catarrh, and interfere with digestion. *The Aromatic Bitters* have similar properties; and in addition, a local stimulant action upon the alimentary canal, due to the presence of a volatile oil, as well as decided astringent qualities from their Tannic and Gallic Acids.

Therapeutics.—They are used as tonics chiefly in:

Atonic Dyspepsia, with pain after eating, Quassia or Calumba.

Convalescence, to promote the appetite and to aid digestion.

Diarrhœa, depending on indigestion, or an irritable intestinal mucous membrane, Gentian or Calumba.

Flatulence, an infusion of Calumba, Ginger, ʒʒ ʒss, and Senna ʒj.

Ascarides Vermiculares, Quassia internally, and as an enema.

Cough of Phthisis, Prunus Virginiana in cold infusion (?).

As Vehicles, the various bitter infusions are much used. The Syrup of Wild Cherry is an ingredient of almost every cough mixture. Quassia, Gentian and Calumba may be prescribed with Iron, as they contain no Tannin.

EUCALYPTUS—Blue Gum-tree

Composition.—The leaves of *Eucalyptus globulus*, or Blue Gum-tree (nat. ord. Myrtaceæ), a native of Australia, now grown in California, Italy, etc. It contains Tannic Acid, a Volatile Oil, a fatty acid, and a resin. The oil consists of three oils, which distil over at different temperatures, the first product being called *Eucalyptol* (see below).

Preparations and Derivatives.

Fluidextractum Eucalypti; Fluidextract of Eucalyptus, is three-fourths alcohol. Dose, ℞x-ʒj [av. ℞xxx].

Oleum Eucalypti, Oil of Eucalyptus. Dose, ℞v-xx [av. ℞viii].

Eucalyptol is an organic oxide (Cineol) obtained from the volatile oil.

Dose, ℞iij-x [av. ℞v], in emulsion or capsule.

Physiological Action.—It stimulates the flow of saliva, gastric juice, and the intestinal secretions; increases the heart's action, and lowers the arterial tension. In large doses it causes great muscular weakness, lowered temperature, nausea and vomiting, indigestion, diarrhœa, and if continued will irritate and congest the kidneys. Absorbing enormous quantities of water from the soil, it is largely cultivated in malarial districts and has rendered habitable a portion of the Roman Campagna, thereby drying up the swampy habitat of the malaria mosquito. It is destructive to low forms of life.

Eucalyptus is diaphoretic. It is eliminated by the skin, bronchial mucous membrane and kidneys, imparting its odor to the breath and urine, being more or less irritant at the points of elimination. The Oil is described under ANTISEPTIC OILS.

Therapeutics.—Eucalyptus is now administered but seldom in:

Chronic Catarrhal Affections of the genito-urinary organs, the broncho-pulmonary mucous membrane, and the bladder, especially the latter.

Bronchitis, acute and chronic, preferably by inhalations.

Asthma, the leaves smoked in combination with Stramonium, Belladonna.

Chronic Gastric Catarrh, and other conditions of the intestinal canal which favor the development of parasites.

Cachexia, and *Convalescence*, as a tonic and stimulant.

Stomatitis and *Tonsillitis*, a decoction of the leaves, locally.

Ulcers, as a disinfectant, it destroying low forms of life.

Intermittent Fever, in which Eucalyptus has some utility, especially in obstinate cases, where it is desirable to stop the use of Quinine.

Phthisis, a mixture of pulverized Eucalyptus leaves, Sulphur and Charcoal, impregnated with the oil, and named *Sanosin*, has been used in Germany by inhalation of its fumes when burning, with reported germicidal effect upon the bacilli. This awaits verification.

HYDRASTIS—Golden Seal

Hydrastis is the root of *Hydrastis Canadensis* (nat. ord. Ranunculacæ), and contain three alkaloids, *Hydrastine*, *Berberine* and *Canadine*, with Tannic and Gallic Acids, etc.

Preparations and Derivatives.

Fluidextractum Hydrastis, Flex. of H. Dose, ℥x-xlv [av. ℥xxx].

Tinctura Hydrastis, Tincture of Hydrastis. Dose, ʒss-ʒss [av. ʒj].

Glyceritum Hydrastis, Glycerite of Hydrastis. Dose, ℥x-xlv [av. ℥xxx].

Hydrastina, Hydrastine, the alkaloid. Dose, gr. $\frac{1}{8}$ – $\frac{1}{2}$ [av. gr. $\frac{1}{6}$].

Hydrastina Hydrochloridum, Hydrastinine Hydrochloride, the salt of an artificial alkaloid derived from Hydrastine. Dose, gr. $\frac{1}{4}$ –j [av. gr. ss], in capsule or hypodermically.

**Hydrastin*, is an impure extract containing Berberine, Hydrastine and resin. Dose, gr. ij–v.

Physiological Action.—Hydrastis is an astringent bitter, promotes appetite and digestion, increases the secretions of the gastro-intestinal tract. Long used, it deranges digestion and causes constipation. It is an antiperiodic, and a protoplasmic poison, arresting the movements of the white blood corpuscles.

Hydrastine stimulates the medullary centres and the intestinal, cardiac,

and uterine muscles, raises arterial tension, slows and strengthens the heart beat, quickens respiration, promotes intestinal peristalsis and uterine contraction. In toxic dose it stimulates the spinal cord, causing tetanic convulsions, depresses the motor nerves and the muscles, and finally paralyzes the medullary and spinal centres and the heart, death occurring by respiratory paralysis. It is a poison to the muscular system, both striated and non-striated, throughout the body.

Hydrastine is a powerful depressant to the entire motor tract, from the cerebral cortex to the muscular tissue. It has a stimulant effect upon the circulation, causes the heart to act more slowly and more powerfully, and contracts the blood vessels, producing a marked and prolonged rise of arterial tension throughout the body. It is believed to have a powerful antispasmodic action, and to decrease the general excitability of the cerebral cortex.

Therapeutics.—Hydrastis is chiefly used as a stomachic tonic, an anti-periodic, a mild astringent, and an antiseptic, In:

Catarrh of the stomach, duodenum, gall-ducts, intestine, bladder, uterus, vagina; in gonorrhœa, gleet and chronic nasal catarrh, it is an excellent sedative, both locally and internally.

Syphilitic Affections, of the mouth, throat and nares, the fluidextract locally, as a palliative.

Ulcers and Sores, of unhealthy character, locally applied.

Stomatitis, both mercurial and aphthous, the fluidextract locally.

Constipation, when due to deficient intestinal secretion (?).

Rectal Fissure and Hemorrhage, the fluidextract locally.

Intermittents, here Hydrastine stands next after Quinine (?).

Metrorrhagia, Hydrastinine as a uterine vaso-constrictor, in dose of gr. j in 10 per cent. solution hypodermically.

Epilepsy, Hydrastinine is given with benefit in some cases, in doses of gr. $\frac{1}{4}$ to $\frac{1}{2}$, up to gr. ij daily.

AGENTS PROMOTING WASTE

POTASSIUM

Salts and their Preparations.

Potassii Hydroxidum, Potassium Hydroxide, Potassa (Caustic Potash), soluble in 0.5 of water and in 2 of alcohol. A painful and deep-acting escharotic.

Liquor Potassii Hydroxidi, Solution of Potassium Hydroxide (Solution of Potassa), a 5 per cent. aqueous solution. Dose, ℥v-℥ss [av. ℥xv], well diluted.

Potassii Acetas, Potassium Acetate, soluble in 0.4 of water and in 1.0 of alcohol. Dose, gr. v-℥j [av. gr. xxx].

Potassii Carbonas, Potassium Carbonate, soluble in 1.1 of water, insoluble in alcohol. Dose, gr. ij-xx [av. gr. xv].

Potassii Bicarbonas, Potassium Bicarbonate, soluble in 3.2 of water. Dose, gr. v-xlv [av. gr. xxx].

Potassii Chloras, Potassium Chlorate, soluble in 16.7 of water. Dose, gr. j-x [av. gr. iv]. Is explosive when mixed with organic matters (cork, sugar, tannic acid, etc.) or with oxidizable substances (sulphur, phosphorus, etc.) or when heated, triturated or concussed. It should never be mixed with glycerin in the presence of a free acid. Troches of this salt are official.

Potassii Citras, Potassium Citrate, soluble in 0.6 of water. Dose, gr. x-xxx [av. gr. xv]. The effervescing Citrate, also a 9 per cent. solution of the Citrate, are official.

Potassii Nitras, Potassium Nitrate (Saltpetre, Nitre), soluble in 4 of water. Dose, gr. v-xx [av. gr. vijss], well diluted.

Potassii Sulphas, Potassium Sulphate, soluble in about 9.5 of water. Dose, gr. x-xlv [av. gr. xxx], well diluted.

Potassii Bitartras, Potassium Bitartrate (Cream of Tartar), soluble in 201 of water. Dose, as a diuretic, gr. xx-℥j [av. gr. xxx]; as a purgative, ℥ss-j.

Potassii et Sodii Tartras, Potassium and Sodium Tartrate (Rochelle Salt), soluble in 1.4 of water. Dose, ℥j-iv [av. ℥ij].

Pulvis Effervescens Compositus, Compound Effervescing Powder (Seidlitz Powder), has of the preceding salt 120 grains, Sodium Bicarbonate 40 grains, in one paper; Tartaric Acid 35 grains in another paper. Dose, 1 to 2 pair, dissolved separately in water, and the solutions mixed.

The Arsenite, Bromide, Iodide, Cyanide, Dichromate, Hypophosphite, and Permanganate are described under their respective acid or other constituents.

Physiological Action.—The *Hydroxide*, like the other caustic alkalies, destroys the tissues by combining with their water, dissolving the albumin and saponifying the fats. The Potassium Salts increase the saliva, promote oxidation and the retrograde metamorphosis. In small doses on an empty stomach they act as mild carminatives, because of the freed

CO_2 ; in large doses they act chemically in the stomach, neutralizing its free acids, and disordering digestion. *The Bicarbonate*, given on an empty stomach, probably unites immediately with the HCl forming $\text{KCl} \cdot \text{CO}_2$ and H_2O . On a full stomach some passes undecomposed into the blood, and makes the urine less acid. *The Vegetable Acid Salts* (Acetate, Citrate, etc.) are decomposed and enter the blood as alkaline carbonates, in which form they are excreted, alkalizing the blood and urine. They are also diuretics, increasing both the water and the solids of the urine, but decreasing the uric acid by increasing oxidation. *The Mineral Salts* (Nitrate, Chlorate, etc.) are not decomposed in the blood, but are eliminated in their own form; the Nitrate being a most active diuretic, the Chlorate irritating the kidneys, and causing albuminuria. In large doses these salts decompose the red corpuscles of the blood, and paralyze the motor ganglia of the heart. *All Potassium Salts, in large doses, are cardiac poisons*, muscular paralyzers, poisonous to protoplasm, especially to nerve tissues and destructive to the ozonizing function of the blood. This is especially true of the Bromide, and the chlorate.

Poisoning by Caustic Alkalies is treated by the Vegetable Acids, as vinegar, lemon-juice; then Demulcents and Oils to protect the mucous membrane, and sustaining measures to support the vital powers.

Therapeutics.—As Alkalies the Potassium salts are used in:

Acute Rheumatism, the Bicarbonate and Nitrate, to saturate the blood, and make the urine alkaline; is effective treatment for sthenic patients.

Lithæmia, the Acetate or Citrate, to promote oxidation. If the Bicarbonate is given, it should be during digestion, to render the urine less acid.

Acidity and Atonic Dyspepsia, the Bicarbonate, with a bitter, in small doses before meals. If given after meals larger doses are required for temporary alleviation by neutralizing the food acids.

Mouth Affections, as ulcerative stomatitis, aphthæ, nursing sore mouth, follicular pharyngitis, the Chlorate locally, as detergent wash. This salt must be cautiously used internally, as it is an irritant to the kidneys.

Inflammations, the Citrate, to promote the excretion of resulting products.

Cardiac Dropsy, if general, the Bitartrate in infusion of Juniper.

Acute Desquamative Nephritis, the Bitartrate, but not in Juniper infusion.

Bites of Insects, alkaline solutions, locally.

Skin Affections, as acne, eczema, prurigo, etc., alkaline solutions, locally.

Catarrhs, nasal, buccal, or vaginal, the Bicarbonate as a detergent wash.

SODIUM

Salts and their Preparations.

Sodii Hydroxidum, Sodium Hydroxide, Soda (Caustic Soda), soluble in 1.7 of water. A powerful escharotic.

Liquor Sodii Hydroxidi, Solution of Sodium Hydroxide, is a 5 per cent. aqueous solution. Dose, $\mathfrak{M}\mathfrak{v}$ - \mathfrak{Jss} [av. $\mathfrak{M}\mathfrak{xv}$], well diluted.

Sodii Bicarbonas, Sodium Bicarbonate, soluble in 12 of water, insoluble in alcohol. Dose, gr. x- \mathfrak{Jss} [av. gr. xv]. Troches of this salt are official, each containing gr. iij.

Sodii Sulphas, Sodium Sulphate (Glauber's Salt), soluble in 2.8 of water. Dose, gr. v-x; as a purgative \mathfrak{Jss} -j [av. \mathfrak{Jss}].

Other official salts are the Acetate, Benzoate, Benzosulphinide, Borate, Cacodylate, Carbonate, Citrate, Chlorate, Cyanide, Glycerophosphate, Hypophosphite, Indigotin-disulphonate, and Perborate; also the Arsenate, Bromide, Chloride, Iodide, Phosphate, Pyrophosphate, Nitrite, Salicylate, Sulphate, Bisulphate, Thiosulphate, and Phenolsulphonate, which are described under the titles of their acid or other constituents.

Physiological Action is similar to that of Potassium, except that the Sodium salts are feebler alkalies, are not so depressant, and are not such powerful cardiac and nerve poisons. Soda is a less active escharotic than potash, having less affinity for water. *Liquor Sodii Hydroxidi* renders the blood and secretions more alkaline, but does not alter nutrition to the extent that the potassium solution does. The Acetate is converted into the carbonate in the blood, and is a less active diuretic than the corresponding potassium salt. The Carbonate is irritant to the stomach, and is chiefly used in the preparation of the other salts. The Nitrate is mildly purgative and diuretic.

Sodium Bicarbonate has the same action as the corresponding potassium salt, except that it is more slowly absorbed and is less depressant. It is antacid, antipruritic, and analgesic, the latter being probably due to the increased alkalinity imparted by it to the blood. Internally in small doses it is neutralized by the hydrochloric acid of the gastric juice; in medium doses it is solvent to the gastric mucus, slightly irritant to the stomach, and sedative to the gastric nerves; in large doses it renders the stomach contents neutral or alkaline and stops the gastric digestion.

The action of the Chloride is described under the title **CHLORUM**. It exists normally in the blood, where it keeps the fibrin and albumin in solution; and in inflammation, being greatly needed therefor, it ac-

cumulates at the seat of the morbid action, disappearing for the time from the urine. Its reappearance therein is a sign of improvement.

Therapeutics.—Internally the Sodium salts might well be preferred to the Potassium and Lithium salts. Locally in:

Burns, a saturated solution of the Bicarbonate is an agreeable application.

Skin Diseases, as eczema, acne, prurigo, pityriasis, fetid sweats.

In Lithæmia, Acid Urine, and Acidity of the Stomach, the Sodium salts may be used.

LITHIUM

Salts and Preparations.

Lithii Carbonas, Lithium Carbonate, soluble in 80 of water. Dose, gr. ij-xv [av. gr. vijss].

Lithii Citras, Lithium Citrate, soluble in 2 of water. Dose, gr. v-xx [av. gr. vijss].

**Lithii Citras Effervescens*, Effervescent Lithium Citrate, has 5 per cent. of the Citrate. Dose, ʒj-iiʒ [av. ʒij], in water as an effervescent drink.

The *Benzoate, Bromide, and *Salicylate are described under their acid or other constituents.

Physiological Action.—The Lithium salts have strong alkaline qualities and act on the system in the same manner as other alkalis (see under POTASSIUM). The high saturating power of this metal makes its salts more alkaline than those of potassium, sodium, or calcium, hence more efficient in alkalinizing the urine. The Carbonate and Citrate are the salts referred to in this connection, the others partaking more of the qualities of their acid factors. Both these salts are antacid and strongly diuretic; the carbonate being but slightly soluble should*be given in carbonic acid water, and the citrate in dilute solution. They are rapidly absorbed, and slowly eliminated by the kidneys, giving an alkaline reaction to the urine. No case of poisoning by them is recorded, but large doses may cause gastro-enteritis, and if frequently repeated may produce depression of the circulation, malaise, and excessive muscular weakness.

Therapeutics are but few. In:

Indigestion and Rheumatism of the obese, the Lithium salts are useful. *Gout and Lithæmia* are treated by the Citrate in full doses.

Chronic Rheumatic Arthritis, the Bromide, both internally and locally.

Myalgia, the Bromide is very useful, in 5-grain doses; but in this case the relief obtained is probably due to the Bromine ion.

CALCIUM

Salts and Preparations.

Calx, Lime, Calcium Oxide, is prepared by burning marble, oyster-shells, or native calcium carbonate. Soluble in 750 of water.

Liquor Calcis, Solution of Lime, Lime-water, contains 0.14 per cent. of Calcium Hydroxide. Dose, ʒss-j [av. ʒss].

Syrupus Calcii Lactophosphatis, Syrup of Lactosphosphate of Lime, contains $8\frac{1}{2}$ per cent. of Calcium Lactophosphate. Dose, $2\frac{1}{2}$ fluidrachms.

Linimentum Calcis, Lime Liniment (Carron Oil), has equal parts of Lime-water and Linseed Oil, mixed by agitation, and used locally.

Calcii Carbonas Precipitatus, Precipitated Calcium Carbonate, insoluble in water or alcohol. Dose, gr. v-xxx [av. gr. xv].

Creta Præparata, Prepared Chalk, is native Calcium Carbonate freed from most of its impurities. Dose, gr. x-xxx [av. gr. xv].

Pulvis Cretæ Compositus, Compound Chalk Powder, has of Prepared Chalk 30, Acacia 20, Sugar 50. Dose, gr. v-ʒj [av. gr. xxx].

Mistura Cretæ, Chalk Mixture, has of the preceding 20, Cinnamon Water 40, Water to 100. Dose, ʒj-ʒj [av. ʒss].

The Chloride, Sulphide, Bromide Hypophosphite, Glycerophosphate and Lactate are official, and are described under their acid or other constituents; *Calx Sulphurata* under Sulphur, *Calx Chlorinata* under Chlorum.

Physiological Action.—Lime, in its unslaked form (quick-lime), has a great affinity for water and readily combines with sulphur, thereby decomposing and destroying organic matter. Upon the skin its action is irritant and superficially caustic, but more severe on the mucous membranes, and if inhaled or swallowed it may produce dangerous local inflammation, followed by ulceration. In weak solution it has an astringent and sedative effect both locally and internally, and acts as an absorbent and an antacid. Chalk possesses the astringent and antacid qualities of lime without its irritant properties.

Calcium Salts play an important part in the circulation and in most of the other functions of the body. The heart or any other muscle, deprived of calcium, will no longer contract. These salts have a remarkable influence on the nutrition of plants and animals, the Phosphate being as essential to the nourishment of the organs of locomotion (car-

tilage, bone, tendon and muscle) as iron is to the blood or phosphorus to the nerve tissue. They possess high coagulating power on the blood; their deficiency gives rise to lymphatic and osseous disease, and their absence results in emaciation and finally death. They are excreted almost entirely by the intestines, a very small portion being absorbed.

Therapeutics.—*Lime-water* is used in the summer vomiting of children, and is added to their milk when the latter is not well retained. *Chalk Mixture* is prescribed in the diarrhoea of children, with sour-smelling watery stools. In *Diphtheria* and *Croup*, the vapors of slaking lime, or lime-water spray, are often very serviceable. *Lime Liniment* is a good application for burns. The *Syrup of Lime* is an antidote to Phenol and Oxalic Acid. Lime salts help in *Tetany*.

AMMONIUM

Ammonium is a hypothetical compound radicle, represented by the formula NH_4 . It does not exist in the free state, but its salts resemble closely those of Potassium and Sodium. The gas *Ammonia*, NH_3 , is produced during the putrefaction of organic matter, and exists free in the air and the soil.

Salts and their Preparations.

Aqua Ammonia, Ammonia Water, contains 10 per cent. of the gas.

Dose, $\mathfrak{M}\text{v}$ – xxx [av. $\mathfrak{M}\text{xv}$], well diluted.

Spiritus Ammonia Aromaticus, Aromatic Spirit of Ammonia, contains the preceding, with Ammonium Carbonate, also some aromatic oils.

Dose, $\mathfrak{M}\text{xv}$ – $\mathfrak{J}\text{j}$ [av. $\mathfrak{M}\text{xxx}$].

Linimentum Ammonia, Ammonia Liniment, has of the Water of Ammonia, 35, Cotton-seed Oil 57, Alcohol 5, Oleic Acid 3.

Ammonii Carbonas, Ammonium Carbonate, soluble in 5 of water. Dose, gr. ij – x [av. gr. v].

Ammonii Chloridum, Ammonium Chloride (Sal-ammoniac), soluble in 3 of water. Dose, gr. j – xx [av. gr. v]. Troches of this salt are official.

Liquor Ammonii Acetatis, Solution of Ammonium Acetate (Spirit of Mindererus). Dose, $\mathfrak{J}\text{j}$ – $\mathfrak{J}\text{j}$ [av. $\mathfrak{J}\text{iv}$].

Other official salts are the Benzoate, Bromide, Iodide, Salicylate and Valerate, which are described under the titles of their acid or other constituents.

Physiological Action.—The Gas *Ammonia* is intensely alkaline, and irritant to mucous membranes; inhaled, it causes spasmodic cough and

a sense of suffocation, prolonged inhalation inducing violent inflammation and oedema of the glottis. The *Aqua*, swallowed undiluted, sets up violent inflammation of the passages and the stomach, and may cause stenosis of the pylorus or œsophagus. *Ammonium Salis*, in medicinal doses, diffuse rapidly, and indirectly stimulate the heart's action; continued, they produce rapid emaciation, from the impaired digestion and increased tissue-waste set up. In large quantity, they injure the structure of the red blood-corpuscles. The *Chloride* has some cholagogue powers, is rapidly absorbed, is considered to have a selective action upon the gastric mucous membrane, but has very little effect after absorption. The *Carbonate*, when administered internally in moderate doses is probably decomposed by the HCl of the gastric juice. It stimulates the respiratory centre, when injected directly into the blood-stream but probably has no action when absorbed from the stomach. The *Solution of the Acetate* is an active diaphoretic if the body be warm, or a diuretic if it be cool. In wineglassful doses it will antagonize many of the immediate effects of alcohol.

Antidotes.—For Ammonia inhaled, give HCl vapors, by inhalation, to form the Chloride; if in solution, give Vegetable Acids, and demulcents to protect the mucous surfaces. Therapeutically, its antagonists are the cardiac sedatives, Aconite, Digitalis, Veratrum, etc.

Therapeutics.—As a stimulant expectorant in:

Chronic Bronchitis, the Chloride in vapor is of service when inhaled.

Catarrhs, gastric, duodenal and intestinal, the Chloride has a reputation; also in bronchial catarrh, when secretion is scanty and tough, and in chronic bronchitis, as a stimulant expectorant, but this alleged action on the bronchial secretions is very doubtful.

Hepatic Disorders, as incipient cirrhosis, chronic torpor, catarrh of the bile ducts and its jaundice, bilious conditions, etc., the Chloride with fluidextract of Taraxacum, has been used with alleged success.

Acidity and Vomiting, the Carbonate in a solution of the Acetate (?).

Poisoned Bites and Stings are treated locally with Aqua Ammonia.

As a Cardiac Stimulant in syncope, thrombosis, hemorrhage, chloroform narcosis, snake-bites and hydrocyanic acid poisoning, the Spirit inhaled; or the diluted Aqua by mouth; acts reflexly by relaxing the cardiac inhibition.

Inflammations, the Chloride in alcohol and water locally, as a refrigerant lotion, producing a considerable degree of cold.

ANTIMONIUM—Antimony**Salts and Preparations.**

Antimonii et Potassii Tartras, Antimonium and Potassium Tartrate (Tartar Emetic). Dose, gr. $\frac{1}{6}$ – $\frac{1}{4}$ [av. as expectorant gr. $\frac{1}{2}$, as emetic gr. ss], but after tolerance is established as much as gr. ij may be given.

**Vini Antimonii*, Wine of Antimony, has about gr. ij of Tartar Emetic to the \mathfrak{z} . Dose, \mathfrak{Mv} – \mathfrak{xx} [av. \mathfrak{Mxv}]. No longer official.

Syrupus Scillæ Compositus, Compound Syrup of Squill (Cox's Hive Mixture), contains about gr. j of Tartar Emetic to the \mathfrak{z} , with Squill, Senega, etc. Dose, \mathfrak{Mj} – \mathfrak{zj} [av. \mathfrak{Mxxx}], cautiously in children.

Poisoning by Tartar Emetic is treated by Tannic Acid in some form, as an antidote; then Opium or Alcohol as an antagonist, and demulcent drinks freely to protect the mucous membrane.

Physiological Action of Tartar Emetic.—It is a systemic and local emetic, a diaphoretic, an arterial depressant, and a gastro-intestinal irritant; has a styptic taste, and causes constriction of the fauces. It promotes body waste and the rapid excretion of waste products. In small doses, it stimulates the secretions of the stomach and intestinal canal, the salivary glands, liver and pancreas. In larger doses, it produces vomiting and purging, with evacuations much like the "rice-water discharges" of cholera, and great prostration of the vital powers. *Toxic Doses* produce similar symptoms, with epigastric pain, cyanosis, delirium, motor and sensory paralysis, suppression of urine, collapse, much the phenomena of Asiatic Cholera. It is depressant to the heart-muscle, combines with the red blood-corpuscles, depressing their oxidizing power, lowering the blood pressure, and reducing the temperature. Being eliminated by all the excretory organs, including the skin, it excites follicular inflammation therein, resulting in a papular eruption on the integument, which becomes vesicular and pustular, the pustules being umbilicated, like those of variola. This may be produced by rubbing it into the skin.

Therapeutics.—The use of Tartar Emetic as an antiphlogistic was formerly very much abused, and has now practically become obsolete. Its emetic action, though certain, is too slow to be of service in poisoning cases, and too depressant for children.

Acute Cold and Bronchitis, gr. $\frac{1}{6}$ with gr. $\frac{1}{6}$ of Morphine.

Asthma and Emphysema are much relieved by doses of gr. $\frac{1}{6}$, to relax spasm.

Whooping of young children, with dyspnoea and cough, simulating asthma, may be stopped by gr. j in $O\frac{1}{2}$ Water, of which teaspoonful doses hourly. It should be used with great caution with children.

VEGETABLE ACIDS

Vegetable Acids used in Medicine.

Acidum Aceticum Dilutum, Diluted Acetic Acid. Dose, ℥xv-℥j [av. 3ss].

**Acetum*, Vinegar, an impure dilute acetic acid, formerly official.

Acidum Citricum, Citric Acid. Dose gr. v-xv [av. gr. viijss].

**Limonis Succus*, Lemon Juice, contains Citric Acid about 7 per cent. Dose, ʒss-iv [av. ʒj].

Syrupus Acidi Citrici, Syrup of Citric Acid, has 1 per cent. of Citric Acid, and is used for flavoring. Dose, indefinite.

Acidum Tartaricum, Tartaric Acid, is an ingredient of the Compound Effervescing Powder (see under POTASSIUM). 20 grains neutralize 27 grains of Potassium Bicarbonate or 22 grains of Sodium Bicarbonate. Dose, gr. v-xx [av. gr. viijss].

Physiological Action.—In concentrated form they have escharotic powers, and produce gastro-enteritis if swallowed. In dilute form they diminish thirst and allay restlessness. They form salts in the stomach, thus enter the blood, and are there oxidized, producing carbonates which decrease the acidity of the urine. They promote secretion, and increase the water of the urine. Long continued they cause emaciation. Tartaric Acid has been fatal in a dose of ʒj. Acetic has caused death once. Citric seems to be non-toxic in man.

Therapeutics.—Tartaric Acid is rarely used except in the effervescing powders, Citric being preferred. The latter is used in:

Scurvy, as a prophylactic and a curative agent, as Lemon-juice.

Acute Rheumatism, Lemon-juice freely, ʒj-ij used 4 or 5 times a day.

Fevers, Lemonade freely, as a refreshing and refrigerant drink.

Inflammations, Dilute Acetic in superficial inflammations of the skin.

Skin Affections, as warts, pityriasis, etc., Glacial Acetic as a caustic.

Obesity, Lemon-juice to correct fatness, acts by impairing digestion (?).

Atheromatous Degeneration may be retarded by the daily use of Lemon-juice, which dissolves the excess of inorganic matter, permitting its elimination.

SULPHUR

Salts and Preparations, etc.

Sulphur Sublimatum, Sublimed Sulphur, is prepared from crude sulphur by sublimation and condensation. Dose, gr. x-3ij [av. 3j].

Sulphur Lotum, Washed Sulphur, prepared by digesting the preceding with water of ammonia to remove arsenic sulphide and neutralize acids. Dose, gr. x-3ij [av. 3j].

Sulphur Præcipitatum, Precipitated Sulphur, prepared by boiling sublimed sulphur with lime, and decomposing the calcium compounds with hydrochloric acid. Dose, gr. x-3ij [av. 3j].

Unguentum Sulphuris, Sulphur Ointment, has of Washed Sulphur 15 per cent., with Benzoinated Lard.

Pulvis Glycyrrhizæ Compositus, Compound Licorice Powder, contains of washed Sulphur 8 per cent. Dose, ʒss-jss [av. 3j].

Acidum Sulphuricum, Sulphuric Acid, is described under MINERAL ACIDS, *ante*, page 44.

Acidum Sulphurosium, Sulphurous Acid, contains 6 per cent. of Sulphur Dioxide, and 94 per cent. of water. Dose, ℥v-3j [av. ℥xxx], largely diluted.

**Sodii Sulphis*, Sodium Sulphite, soluble in 4 of water. Dose, gr. v-xxx [av. gr. xv], even up to 3j.

**Sodii Bisulphis*, Sodium Bisulphite, soluble in 4 of water. Dose, gr. ij-xx [av. gr. vijss].

Sodii Thiosulphas, Sodium Thiosulphate (Sodium Hyposulphite), Soluble in 1.5 of water. Dose, gr. v-xv [av. gr. xv].

Calx Sulphurata, Sulphurated Lime, is a mixture of CaS, CaSO₄, and C, in varying proportions, containing at least 60 per cent. of Calcium Sulphide. Dose, gr. ʒ0-ij [av. gr. j], in trituration with sugar of milk.

Sulphuris Iodidum, Sulphur Iodide, is used only as an ointment, gr. xxx to the ʒ.

**Ichthyol*, Ammonium Sulpho-ichthyolate, is obtained by the distillation of bituminous rocks from the Tyrol, and regarded as the residue of extinct fishes. It contains Sulphur in the proportion of about 10 per cent., is soluble in a mixture of Ether and Alcohol, mixes with vaselin, oils and lard, and is non-irritant to the skin. For local use, in a 10 to 20 per cent. ointment.

The sulphates are described under the titles of their respective basic constituents.

Physiological Action.—*Sulphur* is a very mild laxative. It is dissolved by alkaline solutions and oils, hence is absorbed from the small intestine, entering the blood, and discoloring silver coins carried by those using it, by forming a sulphide of silver. *Sulphurous Acid* has great affinity for oxygen, and is a powerful disinfectant and deodorizer, and destructive to all low life. Its gas inhaled is irritant to the glottis, causing inflammation of the passages. *The Sulphites and Hyposulphites* are partly decomposed by the acid of the stomach, sulphurous acid being given off, and the balance converted into sulphates and absorbed, undergoing elimination as sulphates by the kidneys. *The Sulphides* also are partly converted into sulphates. They are irritant to the stomach, etc., extremely nauseous in taste and smell, increase the secretion of the intestinal glands, and are laxative. If administered for some time they impair the blood, and cause emaciation, anæmia, trembling and great debility. *Ichthyol*, in one case, where a 20 per cent. ointment was applied to an eczema infantile, produced a stupor which continued 12 hours, but from which the child made a complete recovery.

Therapeutics.—*Sulphur* is used as a laxative when the stools need softening on account of hemorrhoids and fissure, etc. In:

Scabies, Sulphur locally as a parasiticide; or a solution of Sodium Sulphite in water, 3ss ad 3j, as a bath or wash.

Chronic Bronchitis, with bronchorrhœa, Sulphurous Acid as spray.

Chilblains, Sulphurous Acid with Glycerin is a good application.

Lead Poisoning, Sulphur baths to favor the elimination of the metal.

Suppuration may be prevented or at least limited by Calx Sulphurata internally, in small doses, gr. $\frac{1}{6}$ hourly. For crops of boils, scrofulous sores, glandular enlargements, acne, and suppuration, this remedy proves efficient.

Skin Diseases, Sulphur baths are very useful, especially in pityriasis, prurigo, chronic psoriasis and eczema. In the two last-named diseases Unna employs Ichthyol in ointment with excellent results.

ALTERATIVES

IODINE, IODIDES

Iodum, Iodine, is a non-metallic element, existing in sea-water and sea-plants chiefly, and occurs in bluish-black plates, of rhombic shape, metallic lustre, peculiar odor, acrid taste and neutral reaction. It is

sparingly soluble in water (1 in 5000), readily so in ether and in alcohol (1 in 10), also in a solution of potassium iodide or sodium chloride. Dose, gr. $\frac{1}{20}$ – $\frac{1}{4}$ [av. gr. $\frac{1}{10}$].

Preparations.

Tinctura Iodi, Tincture of Iodine, 7 per cent. Dose, $\mathfrak{m}\text{j}$ – ij [av. $\mathfrak{m}\text{jss}$], but it is generally used as a local application.

Liquor Iodi Compositus, Compound Solution of Iodine (Lugol's Solution), has Iodine 5, Potassium Iodide 10, Water 85. Dose, $\mathfrak{m}\text{j}$ – x [av. $\mathfrak{m}\text{ij}$].

Unguentum Iodi, Iodine Ointment, has of Iodine 4, Potassium Iodide 4, Glycerin 12, Benzoinated Lard 80.

Ammonii Iodidum, Ammonium Iodide, soluble in an equal part of water. Dose, gr. ij – x [av. gr. iv].

Potassii Iodidum, Potassium Iodide, soluble in 0.8 of water. Dose, gr. v – xx [av. gr. vijs].

Sodii Iodidum, Sodium Iodide, soluble in 0.6 of water. Dose, gr. v – xx [av. gr. vijs].

Strontii Iodidum, Strontium Iodide, very soluble in water and in alcohol. Dose, gr. v – xx [av. gr. vijs].

Unguentum Potassii Iodidi, Ointment of Potassium Iodide, a 10 per cent. ointment.

Acidum Hydriodicum Dilutum, Diluted Hydriodic Acid, has 10 per cent. of the acid. Dose, $\mathfrak{M}\text{v}$ – xv [av. $\mathfrak{M}\text{viij}$].

Syrupus Acidi Hydriodici, Syrup of Hydriodic Acid, contains about 1 per cent. of the absolute acid. Dose, $\mathfrak{Z}\text{ss}$ – ij [av. $\mathfrak{Z}\text{j}$].

Iodoformum, Iodoform, Formyl Iodide. Dose, gr. j – vj [av. gr. iv]. The Ointment is of 10 per cent. strength.

**Iodolum*, Iodol, Tetra-iodopyrrol, insoluble in water. Dose, gr. j – x [av. gr. iv], in tablets.

Thymolis Iodidum, Thymol Iodide (Aristol), contains 45 per cent. of Iodine, used locally as a non-toxic substitute for Iodoform.

**Iodo-tannin* is Tannic Acid in Tincture of Iodine. For local use.

**Iodized Phenol*, Carbolated Iodine, a mixture of Iodine and Phenol in various proportions, for local use in gynecology.

**Bismuthi Subiodidum*, Bismuth Subiodide, a heavy, dark-red, impalpable powder, only used locally, as a dressing for wounds, sores, etc., and a substitute for Iodoform. [See *ante*, under BISMUTH.]

**Iodipin* is a compound of Iodine with the fatty acids of Sesame Oil, a yellow or brown fluid, marketed in 2 forms, containing respectively

10 and 25 per cent. of Iodine. Dose of the former 3j-iv, thrice daily, in emulsion or capsules.

**Europhen*, Isobutyl-cresol Iodide, contains about 27 per cent. of Iodine, which it gives up in the presence of water; an amorphous, yellow powder, perhaps the best of the substitutes for Iodoform.

Iodides of Arsenic, Silver, Mercury, Iron, Lead, Sulphur and Zinc are classed with their other bases, being allied more closely with them, in their actions and uses, than with Iodine.

Incompatibles.—Iodine and the Iodides are incompatible with many substances and are best administered alone. *Potassium Iodide* may be prescribed with Tincture of Cinchona, Liqueur Potassii Arsenitis, or Ammonium Carbonate. It is usually given in some simple vehicle, the Compound Syrup of Sarsaparilla being a favorite one.

Physiological Action.—*Iodine* is irritant, also vesicant if used in quantity, staining the skin yellow. Combining with the hydrogen of phosphoretted and sulphuretted gases it is a disinfectant and deodorant. *The Iodides* are very diffusible and rapidly excreted; setting free iodine at the points of elimination, they are irritant, inducing violent coryza, with soreness of the throat and eyes, headache and profuse mucous discharge, with irritation of the kidneys. They induce great waste and rapid elimination of waste products, causing anæmia, emaciation, and depression, if used for any length of time. They combine with foreign substances in the system and remove them. *Iodism* comprises the foregoing symptoms, together with frontal headache, a saline taste in the mouth, dysphagia, an acne-form eruption on the face and limbs, and temporary impotence. Sometimes the eruption is furuncular, or even purpuric. Copious dilution of these salts with water promotes their excretion, and to a great extent prevents these results from following upon their continued administration, as is sometimes necessary in the treatment of disease.

Iodoform contains from 94 to 97 per cent. of Iodine. It was formerly used extensively as a surgical dressing, but its use has been largely abandoned. Its antiseptic properties are very weak, it is poisonous when absorbed, and its peculiarly disagreeable odor makes it particularly obnoxious.

Iodol has the same action as Iodoform, but is odorless and is said to be devoid of toxic power. Though insoluble in water it dissolves readily in the gastric juices, and is rapidly absorbed and diffused through the system.

Toxicology.—The antidote to free Iodine in *Starch*, with the object of forming an Iodized Starch, which should then be evacuated from the stomach. In chronic poisoning by the Iodides, a free salivary flow, excited by chewing *Pyrethrum-root*, will hasten the elimination of the drug.

Therapeutics of Iodine.—The tincture is much used locally as a counter-irritant, and an alterative application. Iodo-tannin is chiefly employed as an antiseptic and alterative application in local diseases. The preparations of Iodine are used with benefit in:

Surgical Operations, to disinfect the field.

Inflammations, Tincture of Iodine locally, to promote absorption.

Skin Diseases, the Glycerite or Tincture, in chloasma, lentigo, lupus.

Chronic Diseases of the Spleen and Liver, the Tincture or Ointment may be used locally for counterirritation.

Glandular Tumors, hypertrophied tonsils, cervical cysts, etc., the Tincture or Compound Solution parenchymatously injected, is an efficient resolvent.

Empyema, Hydrocele, Ovarian Cysts, etc., the Tincture injected undiluted, is one of the best applications, to prevent return of the effusion. This method has been largely discarded.

Sores, Ulcers, Fissures, etc., Iodoform, Iodo-tannin, or Iodized Starch, are highly recommended, as local antiseptics and alteratives.

Vomiting of Pregnancy, drop doses of the tincture every hour, have often succeeded in very obstinate cases.

Therapeutics of the Iodides.—They are especially used in:

Acute Catarrh and Hay Fever, Potassium Iodide with Arsenic internally; also Iodine and Phenol in weak solution locally.

Chronic and Capillary Bronchitis, the Iodide of Iron, in small doses, rapidly administered, is occasionally efficacious.

Catarrhal Pneumonia, the Ammonium Iodide, to prevent caseation of the products. Arsenic may well be combined with it.

Spasmodic Asthma, Potassium Iodide, in 15- to 30-grain doses, is often efficient, especially when the asthma is due to bronchial catarrh.

Aneurisms, Potassium Iodide, in large doses (gr. xv-xxx) is often curative of internal aneurisms where there is a syphilitic taint, when conjoined with absolute rest.

Tertiary Syphilis, and many of its results, as neuralgiæ, paralysis from gummata, syphilitic ulcerations, syphiloma of the internal viscera, chronic rheumatism and sciatica of syphilitic origin, lupus of syphilitic

or scrofulous origin, are all best treated by Potassium Iodide. It must be given in large doses and continuously for months or years.

Mercurial Poisoning, and other chronic metallic toxæmiæ, Potassium Iodide, to promote elimination of the poison.

Malaria, the Ammonium Iodide with Arsenic, in chronic malaria.

Tonsillitis, and simple sore throat, a weak gargle of Potassium Iodide.

Chronic Bright's Disease, the prolonged use of Potassium Iodide has seemed to retard the progress of the parenchymatous changes.

Chronic Rheumatism is frequently benefited, especially if there is any history of a syphilitic taint.

Therapeutics of Iodoform.—As a local application this agent and its substitutes have been extensively used in the treatment of epithelioma, chancre and chancroid, wounds, ulcers, sores, etc., but its use at present is rapidly on the decline. Formerly it was recommended, also, for *internal* administration in the treatment of Chronic Gastric Catarrh, Bronchitis, Tuberculosis, Diabetes and Syphilis, but very few physicians would be guilty of such treatment today. If their pharmacologic consciences did not forbid it, the outraged feelings of the patients probably would.

Hydriodic Acid is used as a substitute for Iodine and the Iodides, being less offensive to the taste and stomach. It is chiefly used in the form of the Syrup, the Acid itself not being a stable preparation.

HYDRARGYRUM—Mercury

Preparations and Salts.

Hydrargyrum cum Creta, Mercury with Chalk (Gray Powder). Dose, gr. ss-x [av. gr. iv]. It has 38 per cent. of metallic mercury.

Massa Hydrargyri, Mass of Mercury (Blue Mass, Blue Pill), has 33 per cent. of metallic mercury. Dose, gr. ss-x [av. gr. iv].

Ungentum Hydrargyri, Mercurial Ointment, has 50 per cent. of Mercury.

Unguentum Hydrargyri Dilutum, Blue Ointment, has of the preceding 67, with Petrolatum 33.

**Emplastrum Hydrargyri*, Mercurial Plaster, has 30 per cent. of Mercury, also the Oleate 1, Hydrous Wool-fat 10, Lead Plaster, 59.

Hydrargyri Chloridum Corrosivum, Corrosive Mercuric Chloride (Bichloride of Mercury, Corrosive Sublimate), soluble in 16 of water.

Dose, gr. $\frac{1}{80}$ – $\frac{1}{10}$ [av. gr. $\frac{1}{20}$].

Hydrargyri Chloridum Mite, Mild Mercurous Chloride (Subchloride of

Mercury, Calomel) insoluble in water. Dose, gr. $\frac{1}{20}$ gr. v [av. as laxative gr. ij, as alterative, gr. $\frac{1}{4}$].

Hydrargyrum Ammoniatum, Ammoniated Mercury (White Precipitate, Mercury Ammonium Chloride), used only in a 10 per cent. ointment.

Hydrargyri Iodidum Rubrum, Red Mercuric Iodide (Biniodide of Mercury), soluble in solution of potassium iodide. Dose, gr. $\frac{1}{60}$ – $\frac{1}{10}$ [av. gr. $\frac{1}{20}$].

Hydrargyri Iodidum Flavum, Yellow Mercurous Iodide (Protiodide of Mercury), insoluble. Dose, gr. $\frac{1}{10}$ – $\frac{1}{8}$ [av. gr. $\frac{1}{6}$].

Unguentum Hydrargyri Nitratiss, Ointment of Mercuric Nitrate (Citrine Ointment), has of Mercury 7, dissolved in Nitric Acid 17 $\frac{1}{2}$, adding Lard 76.

**Hydrargyri Subsulphas Flavus*, Yellow Mercuric Subsulphate (Turpeth Mineral). Dose, gr. ij–vj, as an emetic. Insoluble in water or alcohol.

**Black Wash*, Calomel, 3j, Lime-water Oj, producing the Black Oxide.

**Yellow Wash*, Corrosive Sublimate 3ss, Lime-water Oj, producing the Yellow Oxide of Mercury.

Triturations of the metal itself, its chlorides or oxides, may be prepared according to the general pharmacopœial formula, and will be found exceedingly efficient preparations.

Other official Salts and preparations are the Yellow and Red Oxides, their Ointments, and an Oleate of the former (25 per cent.); also a Solution of the Nitrate, the Salicylate and Quicksilver.

Incompatibility of the Chlorides of Mercury.—They are incompatible with almost everything. Corrosive Sublimate is easily decomposed, and the combination of Calomel with Hydrochloric Acid or Chlorides is apt to produce Corrosive Sublimate.

Antidote to the Mercurial Salts.—Albumen, the white of one egg to 4 grains of Corrosive Sublimate, an excess redissolving it. Prompt emesis is also necessary, or the stomach-pump, after giving the antidote.

Physiological Action.—Mercury is easily absorbed in any form; is excreted by the liver (in which it tends to accumulate while stimulating its cells), also by the intestinal and salivary glands, the kidneys, and partly by the skin. It has a selective action on the glands, especially the salivary and the pancreas, which it stimulates to the production of pathological secretions.

In small doses, Mercurial salts are blood tonics, increasing the number

of the red corpuscles. They promote waste by stimulating the lymphatic system, and in very small doses are sedative to the mucous membranes. In medium doses, they have a selective cathartic action, irritating the intestinal mucosa and may increase the flow of bile by rapid elimination of the bile salts as do resinous purgatives. *In Full Doses, continued*, they over-stimulate the glands, especially the pancreas, producing pathological secretions, impair the ozonizing function of the blood, diminishing the red corpuscles, and produce a low inflammation in the nervous tissue, resulting in loss of coördinating power.

Corrosive Sublimate, in small doses, prevents hyperplasia of the connective tissue, and causes, in large doses, inflammation and ulceration of the lower bowel. It is a powerful gastro-intestinal irritant, and poisonous also to the cardiac muscle. It is an effective parasiticide, and one of the most efficient of all the antiseptics.

Calomel is very insoluble, and unirritating. It is tasteless, laxative in grain doses, an efficient diuretic, and acts on the excrementitious intestinal glands.

The *Red Iodide* is an irritant poison. The *Acid Nitrate* is a good escharotic, its pain being transient though severe.

Salivation (ptyalism) is produced most readily by Blue Mass, next by Calomel, and least so by Mercury with Chalk. Its first symptoms are sore teeth, spongy gums, profuse saliva, fetid breath, bluish line along margins of the teeth; then swelling of the glands, aching jaws and muscles, and fever, resulting in emaciation, marked anæmia, falling of the hair, ulcerated skin, fetid diarrhœa, trembling, obscure, nervous phenomena, albuminuria, and in women abortion, through impoverished blood.

Therapeutics.—Mercury is undoubtedly a specific in:

Syphilis, in which it is best given in small doses to just short of ptyalism, then stopped, but renewed, and so continued for some time. The Yellow Iodide in small doses (gr. $\frac{1}{10}$ – $\frac{1}{6}$ *ter die*), is the best preparation for internal administration. Mercury is not applicable to tertiary syphilis; therein Potassium Iodide is the remedy.

Tonsillitis, *Parotitis*, and other acute glandular inflammations may often be cured rapidly by Calomel, gr. $\frac{1}{20}$, or Gray Powder, gr. $\frac{1}{8}$, every 2 hours.

Irritable Stomach, vomiting, etc., Calomel in small doses, gr. $\frac{1}{20}$ – $\frac{1}{10}$.
Ileo-colitis of Infants, gr. $\frac{1}{6}$ of Gray Powder, or Calomel, gr. $\frac{1}{20}$ – $\frac{1}{12}$.
Dysentery of Adults, stool slimy and bloody, Corrosive Sublimate, gr. $\frac{1}{100}$.

Membranous Laryngitis, the Subsulphate (gr. ii-j-v) as emetic.

Typhoid Fever, Calomel, a 10-grain dose each day for 3 days, is antipyretic. This is the German specific typhoid treatment. This treatment is not recommended.

Hepatic Cirrhosis, Corrosive Sublimate, gr. $\frac{1}{20}$ *ter die*, in the first stage.

Skin Diseases, as psoriasis, herpes pruritus, acne, pityriasis, etc., ointments of Calomel, Corrosive Sublimate, and the Iodides.

Parasitic Skin Diseases, Corrosive Sublimate lotions, gr. ij ad 3j; or a 5 per cent. solution of the Oleate with $\frac{1}{8}$ part of Ether.

Conjunctivitis, Ointment of the Yellow Oxide.

Goutre, Enlarged Spleen, Oint. of the Red Iodide, rubbed in with heat.

Antiseptic Solution, Corrosive Sublimate, gr. viiss to a quart of hot water, makes a solution of 1 in 2000, to a pint, 1 in 1000.

AURUM—Gold

Auri et Sodii Chloridum, Gold and Sodium Chloride, a mixture of dry Gold Chloride and Sodium Chloride, equal parts of each. Dose, gr. $\frac{1}{80}$ – $\frac{1}{6}$ [av. gr. $\frac{1}{10}$], in pill or solution, once or twice daily.

**Auri Bromidum*, Gold Bromide, insoluble in water. Dose, gr. $\frac{1}{20}$ – $\frac{1}{6}$.

**Liquor Auri et Arseni Bromidi*, Solution of Gold and Arsenic Bromide (Arsenauro). Dose, ℥v–xv, thrice daily after meals, or hypodermically.

Triturations of the metal itself may be prepared according to the general formula of the U.S.P. for Triturations.

Physiological Action.—The pharmacodynamics of Gold have not been developed very far. Small doses probably produce no appreciable effect. Full doses cause nausea and vomiting, glandular irritation, salivation without loosened teeth or sore gums, increased urine, sweats, and fever (the auric fever); nutrition is impaired, and rapid waste set up. *Toxic Doses* produce effects similar to those from Corrosive Sublimate, violent gastro-enteritis, mental disturbance, convulsions, trembling, paralysis.

Poisoning by Gold Chloride is treated by *Albumen* or flour, and evacuation of the stomach, just as in the case of Hydrarg. Chlor. Corrosivum.

Therapeutics.—The use of Gold has been suggested for the most diverse conditions, but there is no reliable evidence as yet that it is of any medicinal value whatever. As Cushny remarks: "There is no reason to suppose that it (Gold) is of value except by means of suggestion."

COLCHICUM—Meadow Saffron

Source and Composition.—The corm and seed of *Colchicum autumnale* (nat. ord. Liliaceæ). It contains an intensely bitter and poisonous alkaloid, *Colchicine*, which is converted by acids into *Colchicoïn* and a resin, also tannic and gallic acids, etc.

Preparations.—Those of the seeds are the most reliable.

Extractum Colchici Cormi, Extract of Colchicum Corm, made with acetic acid and water. Dose, gr. ss-ij [av. gr. j].

Fluidextractum Colchici Seminis, Fluidextract of Colchicum Seed. Dose, ℥j-v [av. ℥iij].

Tinctura Colchici Seminis, Tincture of Colchicum Seed, strength 10 per cent. Dose, ℥x-℥j [av. ℥xxx].

**Vinum Colchici Seminis*, Wine of Colchicum Seed, strength 10 per cent. Dose, ℥x-℥j [av. ℥xxx].

Colchicina, Colchicine, the alkaloid, soluble in water, and suitable for hypodermic use. Dose, gr. $\frac{1}{160}$ - $\frac{1}{60}$ [av. gr. $\frac{1}{20}$].

Physiological Action.—Colchicum is a drastic purgative, emetic, diuretic, diaphoretic and a gastro-intestinal irritant. Its taste is bitter and acrid. In small doses it increases secretion, especially the urine and the perspiration. In full doses its action is emeto-cathartic, producing profuse watery discharges, great nausea, and muscular feebleness. In large doses it is a powerful gastro-intestinal irritant, causing griping, choleraic discharges, lowered arterial tension, and depression of the heart by reflex action over the distribution of the pneumogastric. Then great prostration, convulsions and collapse, death from exhaustion, with consciousness preserved until carbon dioxide narcosis sets in. On the excretion of the uric acid and urea its influence is a greatly disputed question; but it probably does not increase the flow of bile.

Treatment of Colchicum Poisoning.—Emesis and catharsis. Warm drinks freely. *Tannic Acid* as an antidote. *Morphine* hypodermically, to relieve the distress.

Therapeutics.—Colchicum is sometimes a specific palliative in:

Acute Gout, in which it should be given with an alkali, and kept short of emeto-catharsis. It does not prevent relapses, and its power is weakened by repetition in this disorder. The alkaloid is possibly the most effective preparation in this disease, given in granule of gr. $\frac{1}{60}$, four times daily.

Ascites, due to obstructive disease of the liver, Colchicum in full doses, with Opium to lessen colic, is effective.

Portal Congestions are relieved by Colchicum given with a saline purgative, as it markedly depletes the portal circulation. This is doubtful.

Cerebral Congestion of acute type, Colchicum as a revulsive purgative, but almost too drastic to use.

GUAIACUM—Guaiac

Source and Composition.—It is the resin of the wood of *Guaiacum officinale* or of *Guaiacum sanctum*, trees of the order Zygophyllaceæ; and consists of 3 resins, named Guaiaconic Acid, Guaiac Acid, and Guaiarec Acid. Dose of Guaiac, gr. x-xxx [av. gr. xv] in wafer.

Tinctura Guaiaci, Tincture of Guaiac, strength 20 per cent. Dose, ℥ss-℥j [av. ℥j], in mucilage or syrup.

Tinctura Guaiaci Ammoniata, Ammoniated Tincture of Guaiac, 20 per cent. Dose, ℥x-℥j [av. ℥xxx].

Physiological Action.—Guaiac is diaphoretic, expectorant(?) and alterative. Its taste is acrid and very disagreeable. It irritates the gastric mucous membrane, increasing its mucus, salivates by reflex action, and stimulates the intestinal secretions and the flow of bile. Though a colloidal body it enters the blood, producing diaphoresis, and stimulating the excretory glands and the production of bronchial mucus. Its continued use produces gastric catarrh, and in large doses it causes vomiting, purging and severe congestive headache.

Therapeutics.—It is a remedy in:

Tonsillitis to abort, ℥ss of Tincture every 4 hours, also as a gargle.

Neuralgic Dysmenorrhœa, Guaiac is promptly alleviative.

Chronic Rheumatism, in which it has an established reputation.

Guaiac has largely fallen into disuse, both because of its disagreeable taste, and because of its uncertain effects.

STILLINGIA—Queen's Root

Source and Composition.—It is the root of *Stillingia sylvatica*, an indigenous plant of the nat. ord. Euphorbiaceæ; and contains a Resin and a Volatile Oil, but the active principle has not yet been isolated.

Preparations.—They should be made from the fresh root, as those from the dried root are almost inactive. Dose of the root, gr. x-3j [av. gr. xxx].

Fluidextractum Stillingiæ, Fluidextract of Stillingia. Dose, ℥x-3j [av. ℥xxx].

**Succus Alterans* (McDade's), a proprietary preparation much used by southern physicians in syphilis. It is said to contain Stillingia, Lappa, Phytolacca, Sarsaparilla, and Xanthoxylum. Dose, 3j-iv thrice daily.

Physiological Action.—Stillingia is diaphoretic, diuretic, purgative, sialogogue and alterative. Its taste is acrid and pungent. It increases the action of the heart, skin and kidneys; and the gastric, intestinal and salivary secretions. Full doses excite epigastric pain, nausea and vomiting.

Therapeutics.—It is considered valuable in:

Strumous and Syphilitic Affections, as an alterative.

Ascites from hepatic changes, in full doses to remove fluid.

Portal Congestions of malarial origin, torpid liver, and jaundiced skin.

Constipation due to deficient intestinal secretion, it is often very useful.

Hemorrhoids due to hepatic obstruction, or to chronic constipation.

The pharmacologic data concerning Stillingia is very meagre. Its use seems advocated by casual observers only.

SANGUINARIA—Blood-root

Source and Composition.—It is the rhizome of *Sanguinaria Canadensis* (nat. ord. Papaveraceæ), and contains the alkaloids *Sanguinarine*, *Chelerythrine*, *Protopine*, and *Homochelidonine*, with citric and malic acids, resins, etc. The salts of its alkaloids are of brilliant red and orange colors, and are freely soluble in water. Dose of the powdered root, as an emetic gr. x-xxx, best given in pill.

Preparations.

**Fluidextractum Sanguinariæ*, Fluidextract of Sanguinaria. Dose, as stimulant Mj-v [av. Mij], as an emetic ℥x-xxx, cautiously.

Tinctura Sanguinariæ, Tincture of Sanguinaria, strength 10 per cent.

Dose, as an emetic 3j-iiij.

**Sanguinarina*, Sanguinarine, as found in commerce it is generally a mixture of the alkaloids. Dose, as an expectorant, gr. $\frac{1}{2}$ - $\frac{1}{8}$; as an emetic gr. ss, repeated in 10 minutes.

Physiological Action.—Sanguinaria is sialogogue, and a systemic emetic; also an emmenagogue, a cardiac paralyzer, a violent irritant, an acro-narcotic, and an alterative.

Its taste is bitter and acrid. It causes violent sneezing, increases secretion by irritating the secretory organs as it is eliminated, and produces salivation, catharsis, and emesis with great depression. Full doses are violently irritant, the heart's action being first increased, then depressed, and finally paralyzed by stimulation of its inhibition. It decreases the reflexes by paralysis of the spinal centres, causes dilatation of the pupils, lowered temperature, cold sweats, great thirst, collapse, and death by paralysis of the cardiac and respiratory centres, frequently preceded by convulsions. Locally it is a feeble escharotic.

Sanguinaria is a member of the poppy family, and its alkaloids bear a close resemblance to those of opium. *Sanguinarine* causes tetanus and high excitement, and stands between codeine and thebaine in its action on the central nervous system. It causes violent peristalsis of the bowel, increases the saliva, and is emetic. *Chelerythrine* paralyzes the central nervous system without producing any preliminary stimulation, has the same action as protopine and cryptopine on the muscles, and first irritates and then paralyzes the sensory nerve-endings. *Homocheledonine* resembles morphine in its effects on the central nervous system, but has less stimulant action.

Therapeutics.—Sanguinaria is well employed in:

Chronic Bronchitis, Sanguinaria is a most serviceable remedy (?).

Atonic Dyspepsia, gtt. ij–iij of the Tincture, or gr. $\frac{1}{2}$ of Sanguinarine.

Amenorrhœa of functional character, in non-plethoric subjects.

Croup, in which many authorities rank it a specific remedy.

Scarlatina, the decoction, as a gargle for the sore throat, is very efficient (?).

Hypertrophy of the nasal membrane, Sanguinaria by insufflation.

Ulcers and fungous granulations, the powdered drug, locally.

XANTHOXYLUM—Prickly Ash

Source and Composition.—The bark of *Xanthoxylum Americanum* or of *Fagara Clava-Herculis*, nat. ord. Rutaceæ. It contains an acrid green oil, tannic acid in small quantity, two resins, and the alkaloid *Xanthoxyline*, which is probably identical with Berberine. Dose, gr. x–xlv [av. gr. xxx].

Preparations.

Fluidextractum Xanthoxyli, Fluidextract of Xanthoxylum. Dose, ℥x-xlv [av. ℥xxx].

**Decoctum Xanthoxyli*, Decoction of Xanthoxylum, ℥j to the quart. Dose, a pint in divided doses during the 24 hours.

Physiological Action.—The taste of Xanthoxylum is aromatic, soon becoming acrid and bitter. It is a local and systemic sialogogue, causing profuse salivation, with tingling in the tongue, and increased secretion from stomach, intestines, and pancreas. It is also diaphoretic and diuretic, increases the action of the heart, and raises the arterial tension.

Therapeutics.—Xanthoxylum is used in:

Chronic Pharyngitis, the Fluidextr., ℥x-xxx, internally, the Decoction locally, as a gargle, give very good results in bad cases.

Chronic Rheumatism, myalgia, lumbago, etc., it has some reputation.

Toothache, the root or bark chewed is a popular remedy.

Paralysis of the Tongue, is said to be removed by chewing the root (?).

MEZEREUM—Mezereon

Source and Composition.—The bark of *Daphne Mezereum*, a European shrub of the nat. ord. Thymeleaceæ. It contains an inactive glucoside, named *Daphnin*, an acrid Resin, an inert fixed oil, etc. Dose, gr. j-x [av. gr. vijss].

Preparations.—It is a constituent of the Compound Decoction and Compound Fluidextract of Sarsaparilla.

**Fluidextractum Mezerei*, Fluidextract of Mezereum is too acrid for internal use.

Physiological Action.—Mezereon is a sialogogue, and, in small doses, laxative and alterative. It is intensely acrid, and in sufficient dosage an irritant poison, causing violent vomiting, purging, nephritis, and gastro-enteritis.

Therapeutics.—Its principal use is that of a local irritant, to keep up the discharge from issues or blisters, and to stimulate indolent ulcers. It has been used with asserted benefit in Chronic Rheumatism, Strumous and Syphilitic affections, Toothache and Paralysis of the Tongue.

BERBERIS—Barberry

Berberis is the root of *Berberis aquilifolium*, the Oregon grape, a plant of the nat. ord. Berberidacæ, indigenous to the Pacific slope. Its activity is due to its alkaloid, *Berberine*, which is found in several other plants, viz., *Hydrastis*, *Coptis*, *Podophyllum*, *Menispermum*, *Calumba*, *Xanthoxylum*, etc.

Preparations.

**Fluidextractum Berberidis*, Fluidextract of *Berberis*. Dose, ℥x-xl [av. ℥xxx].

**Berberina*, *Berberine*, the alkaloid, usually occurs in commerce as a Hydrochloride, prepared from *Hydrastis*, and called *Hydrastin*. Dose, gr. j-x.

Physiological Action and Therapeutics.—*Berberis* is an astringent bitter, in small doses a tonic and stomachic, but in large ones it is cathartic, producing watery discharges with much abdominal pain. It is generally considered to have a high degree of alterative power. The alkaloid is astringent and antiseptic, in full doses is a gastro-intestinal irritant, and has some value as an antiperiodic.

Berberis has been used as an internal remedy for typhoid and malarial fevers, diarrhœa, dyspepsia, and the uric acid diathesis, with tendency to formation of calculi. It has given better satisfaction, however, as an alterative tonic in strumous and syphilitic affections, and locally as an application in conjunctivitis. The *Hydrochloride of Berberine* is a favorite application to the urethral mucous membrane, as an antiseptic and astringent injection in gonorrhœa. Its use may well await further investigation.

SARSAPARILLA—Smilax

Source and Composition.—The root of *Smilax officinalis*, and other species of *Smilax* (nat. ord. Liliacæ), a vine growing in Honduras, Brazil, etc. It contains a principle, *Smilacin*, or *Parillin*, from which is derived another. *Parigenin*. also an Essential Oil, Calcium Oxalate, Starch, Resin, etc.

Preparations.

Fluidextractum Sarsaparilla; Fluidextract of *Sarsaparilla*. Dose, ℥xx-3j [av. ℥xxx].

Fluidextractum Sarsaparilla Compositum, Compound Fluidextract of

Sarsaparilla, has Sarsaparilla 75, Glycyrrhiza 12, Sassafras 10, Mezerum 3, Glycerin 10, Diluted Alcohol to 100. Dose, ℥xx-℥j [av. ℥xxx].
Syrupus Sarsaparilla Compositus, Compound Syrup of Sarsaparilla, has of the fluidextract 20 per cent., also Senna, and the oils of Anise, Gaultheria and Sassafras. Dose, ℥j-℥j [av. ℥iv].

**Decoctum Sarsaparilla Compositum*, contains also Guaiac, Sassafras, Mezereum, and Licorice. Large doses are necessary, ℥j-iv.

Physiological Action.—Negative results have followed the most carefully executed experiments made with this drug and its principles. It probably has no activity, though by some it is considered to be an efficient diaphoretic, also diuretic, tonic and alterative.

Therapeutics.—Formerly held in repute as an alterative, it was much used as a "blood-purifier" in domestic practice, and by surgeons in the scrofulous and syphilitic cachexiæ. Its value is probably due to its being generally used as a warm decoction in large quantities the warm water causing increased elimination of waste products, promoting the renal and cutaneous circulation, and thus producing diaphoresis and diuresis. In:

Chronic Syphilis, it may be well used as a vehicle for Potassium Iodide in the tertiary form. The Compound Syrup is the best vehicle to disguise the taste of Iodides.

ASTRINGENTS

TANNIC AND GALLIC ACIDS

Source and Extraction.—Tannic Acid is obtained from the galls (*Galla*) of the Dyer's Oak (*Quercus infectoria*), by treatment with Ether. Gallic Acid is obtained from the same galls, after exposure in a warm place for 6 weeks; or from Tannic Acid by the action of dilute Sulphuric acid.

Difference between Tannic Acid and Gallic Acid.—According to some authorities the difference is one of oxidation, Tannic Acid, when oxidized, being converted into Gallic Acid. According to others Tannic Acid is simply Gallic Acid Anhydride, and the difference is one of hydration. Tannic Acid is the more powerful of the two as an astringent. It coagulates albumin and gelatin, while Gallic Acid does not. It is, however, converted into Gallic Acid in the stomach before absorption.

The Acids, their Preparations, and Derivatives.

Acidum Tannicum, Tannic Acid (Tannin), a monobasic organic acid, soluble in 1 of water or glycerin. Dose, gr. j-xx [av. gr. vijs].

Acidum Gallicum, Gallic Acid, an organic acid, soluble in 100 of water, and in 12 of glycerin. Dose, gr. v-xx [av. gr. xv], in solution, pill or powder.

Unguentum Acidi Tannici, Ointment of Tannic Acid, 20 per cent.

Glyceritum Acidi Tannici, Glycerite of Tannic Acid, 20 per cent.

Trochisci Acidi Tannici, Troches of Tannic Acid, have gr. j in each.

Collodium Stypticum, Styptic Collodion, has of Tannic Acid, 20, Alcohol 5, Ether 25, Collodion to 100.

Pyrogallol is a triatomic phenol, obtained chiefly by carefully heating gallic acid. Dose, gr. j-ij.

**Tannigen*, Diacetyl-tannin, an acetic acid ester of tannic acid, used as an intestinal astringent. Dose, gr. iij-viiij.

**Tannalbin*, Tannin Albuminate, contains 50 per cent. of tannic acid. Dose, gr. xv-xxx, up to 3j daily, as an intestinal astringent.

**Tannopin*, a condensation product of tannin (87 per cent.) with hexamethylenamin (13 per cent.), Dose, gr. v-viii, in enteritis.

**Tannoform*, Methylene Di-tannin, a condensation product of tannic acid and formaldehyde. Dose, gr. iv-viiij, as an intestinal astringent.

Physiological Action.—*Tannic Acid* is a more powerful astringent than Gallic Acid. It precipitates pepsin and coagulates albumin, impairs digestion, stops peristalsis, and causes constipation. It enters the blood as tannate of soda, which is entirely devoid of action. It is a crystalloidal body, but combines with colloids; and is a valuable antidote in poisoning by the alkaloids and Tartar Emetic, with which it forms nearly insoluble tannates. Its continued use disorders digestion, irritates the mucous membranes, and produces emaciation. Injected into the veins it causes death by the formation of emboli.

Gallic Acid is a much less powerful astringent, and does not coagulate either albumin or gelatin. "It is useless in therapeutics" (Cushny).

Therapeutics.—Tannic Acid is best used locally, and for astringent effect on the intestinal canal. In the following disorders it has proven specially efficient:

Hemorrhoids, and hemorrhages from the lower bowel, Tannic Acid locally and internally.

Hæmatemesis, not due to inflammation, Tannic Acid, gr. x-xx in solution, taken in two or three divided doses.

Epistaxis, Tannic Acid, the glycerite, has been employed successfully.

Catarrhs, and chronic local affections of the mucous membranes.

Glycerite of Tannin, or better still, Tannic Acid alone, by insufflation.
Gastric Catarrh, Pyrosis, etc., Tannic Acid, internally (?).

Endocervicitis, Leucorrhœa, etc., Tannic Acid with glycerin.

Conjunctivitis, powdered Tannin after the acute stage has passed (?).

Also excellent in corneal ulcers and granular lids.

Dysentery and Diarrhœa, acute and chronic, Tannic Acid with Opium, or Catechu, internally, following a purge.

Skin Diseases, as eczema, impetigo, intertrigo, the Glycerite of Tannin.

Otorrhœa, the Glycerite of Tannin is very serviceable in this affection.

Rectal Fissure and Ulcer, the Glycerite of Tannin locally.

VEGETABLE ASTRINGENTS

Vegetable Astringents nearly all contain some form of Tannic or Gallic Acid, on which their physiological and therapeutical properties depend. The principal ones are the following-named, to wit:

Galla, Nut-gall, is an excrescence on *Quercus infectoria*, caused by the puncture and deposited ova of the insect *Cynips tinctoria*. It contains Tannic Acid, 15 to 75 per cent.; Gallic Acid, 5 per cent. Dose, gr. v-x [av. gr. vijss].

**Tinctura Gallæ*, Tincture of Nut-gall. Dose, ʒss-ijj [av. ʒj].

Unguentum Gallæ, Nut-gall Ointment, strength 20 per cent.

Quercus, White Oak, is the bark of *Quercus alba*, nat. ord. Cupuliferæ. It contains Quercitannic Acid, Quercin, Pectin, etc. The fluidextract is official, the dose being ℥v-xx [av. ℥xv].

Gambir, Gambir (Pale Catechu) is an extract prepared from *Ouroparia Gambir*, nat. ord. Rubiaceæ. A Compound Tincture is official containing 5 per cent. of Gambir and 2½ per cent. of Cinnamon, the dose of which is ʒss-jss [av. ʒj]. Troches are also official, each containing nearly gr. j of Gambir.

Geranium, Cranesbill, the rhizome of *Geranium maculatum*. Contains Tannic and Gallic Acids, and possesses a rather pleasant taste. The fluidextract is no longer official.

Granatum, Pomegranate, the bark of the stem and root of *Punica Granatum*. Contains Punico-tannic Acid, also Tannic Acid, Mannite, and the liquid mixture of alkaloids *Pelletierine*, which is used as a tæniacuge, in doses of gr. ij-vijj [av. gr. iv] of the tannate. The fluidextract is official, the dose being ℥x-ʒj [av. ℥xxx].

Hæmatoxylon, Log-wood, is the heart wood of *Hæmatoxylon campechianum*, nat. ord. Leguminosæ. It contains Tannic Acid, Hæmatoxylon, etc. The extract is no longer official, the dose being gr. v-xx [av. gr. xv].

Hæmatoxylon is a mild astringent, of sweetish taste, producing blood-red stools and urine. It does not constipate nor disorder the bowels, but has caused phlebitis. It is chiefly used for diarrhœa in children.

Hamamelis, Witch-hazel, is *Hamamelis virginica*, nat. ord. Hamamelidaceæ. The bark and leaves are both official, the latter containing 8 per cent. of Tannic Acid. The official preparations are:

Aqua Hamamelidis, Hamamelis Water, distilled from a maceration of the bark. Dose, ʒj-ij [av. ʒij].

(*Pond's Extract*, a proprietary medicine of uncertain composition, is a similar preparation).

**Fluidextractum Hamamelidis Foliorum*, Fluidextract of Hamamelis leaves. Dose, ℥v-xlv [av. ℥xxx].

Hamamelis seems to have some repute in restraining venous hemorrhages, a property not wholly due to its Tannic Acid. In large doses it causes severe throbbing pain in the head. It is used both internally and locally for hemorrhoids, varicose veins and ulcers, and is recommended in hemorrhages from various parts, and externally for sprains and bruises, leucorrhœa, foul ulcers, and the pruritis of eczema.

Kino, Kino, is the inspissated juice of *Pterocarpus Marsupium*, nat. ord. Leguminosæ, growing in India. It contains 75 per cent. of Kinotannic Acid, and is used as an astringent gargle and a constituent of mixtures for diarrhœa. The Tincture (1 per cent.) is official, the dose being ʒss-ij [av. ʒj].

Krameria, Rhatany, the root of *Krameria triandra*, etc. Contains Rhataniatannic Acid, the alkaloid Rhatanine, wax, gum, etc.

**Extractum Krameria*, Extr. of Krameria. Dose, gr. v-x [av. gr. vijss].

**Fluidextractum Krameria*, Flex. of K. Dose, ℥v-xx [av. ℥xv].

**Tinctura Krameria*, Tinct. of K., 20 per cent. Dose, ʒss-ij [av. ʒj].

**Syrupus Krameria*, Syrup of K. Dose, ʒss-iv [av. ʒj].

**Trochisi Krameria*, Troches of K., each has gr. j of the ext.

Rosa Gallica, Red Rose, the petals of *Rosa gallica*. Contains Tannic and Gallic Acids, the volatile oil, Quercitrin, etc. The only official preparation is the Fluidextract, ℥v-ʒj [av. ℥xxx].

Rubus, Black-berry, the bark of the root of *Rubus villosus*, and other varieties of *Rubus*. Contains Tannic Acid, 10 per cent., etc. The former official preparations were: the Fluidextract, Mx-xxx [av. Mxv]; and the Syrup, 3ss-ij [av. 3j]. It is highly esteemed in summer and infantile diarrhoeas.

***Catechu**, an extract from the wood of *Acacia Catechu*, nat. ord. Leguminosæ. Contains Catechu-tannic and Catechuic Acids. Formerly official it is now replaced in the pharmacopœia by other preparations. Dose of the fluidextract, Mj-xxx.

***Coto Bark**, is the bark of an unknown Bolivian tree, and contains an acrid, bitter principle, named *Cotoïn*, but no tannin. It is irritant to the skin and mucous membranes, but is highly recommended as an astringent in most forms of diarrhoea, especially that of phthisis, cholera, and typhoid fever. The tincture, in small doses (Mj-v), is used in diarrhoea of children. Paracoto Bark contains *Paracotoïn*, and has similar properties. Dose, of fluidextract, Mj-x or xv, of Cotoïn, gr. ss-ij, of Paracotoïn, gr. iv-v. Of doubtful utility.

***Pinus Canadensis**, Canadian Pine, properly the *Abies Canadensis* or Hemlock Spruce, of the U. S. and Canada, is the basis of a preparation named the **Concentrated Extract of Pinus Canadensis*, an aqueous, non-irritant astringent, said to have a specific tonic action upon mucous membranes. This preparation received the endorsement of Dr. J. Marion Sims, and has been extensively employed, both locally and internally, as a topical application in uterine and vaginal catarrhs, and as a systemic remedy in catharral inflammation of the gastro-intestinal and broncho-pulmonary mucous membranes (?).

ARGENTUM—Silver

Salts and Preparations.

Argenti Oxidum, Silver Oxide. Dose, gr. ss-ij [av. gr. j] in pill. Is nearly insoluble in water, and is not dangerous as an internal remedy. Explosive with ammonia.

Argenti Nitras, Silver Nitrate. Dose gr. $\frac{1}{6}$ – $\frac{1}{2}$ [av. gr. $\frac{1}{6}$]; if watched, up to gr. j may be given: best in pill or distilled water and alone; never with Tannin or a vegetable extract, lest an explosive compound result.

Argenti Nitras Fusus, Melted Stick (Lunar Caustic), for local use.

***Argenti Nitras Mitigatus**, Mitigated Silver Nitrate, has $\frac{3}{8}$ Potassium Nitrate, and is used locally by ophthalmologists.

- **Argenti Iodidum*, Silver Iodid. Dose, gr. $\frac{1}{4}$ -j, in pill. Is supposed not to discolor the skin, even if taken continuously.
- **Argyrol*, Silver Vitellin, contains 30 per cent. of silver. It is painless and non-irritant, is strongly bactericidal, and of great penetrative power. Solutions of 2 to 10 or 20 per cent. are used as local astringents, of 1 in 1000 for irrigating the vagina, bladder, and urethra.
- **Collargol*, Colloidal Silver, is an allotropic form of the metal, containing 78 per cent. of silver, and soluble in 25 of water. Solutions of 1 in 10,000 to 1 in 5000 are used for irrigating the bladder. Dose, gr. ij-v.
- **Protargol* is a protein silver compound, containing 8 per cent. of the metal, readily soluble in water. Solutions of $\frac{1}{4}$ to 2 per cent. are used as an antiseptic and astringent application in conjunctivitis and gonorrhea.

Incompatibles.—The Nitrate is exceedingly sensitive to organic matter and light, and decomposes readily. All soluble Chlorides are incompatible with it, precipitating the chloride of silver; hence it should be given in distilled water. Most mineral Acids and their salts, Alkalies and their carbonates, Aqua Calcis, and Astringent Infusions are also incompatible with the silver salts.

Antidote to the Silver Salts.—Common Salt freely, it precipitating the insoluble chloride of silver, and also acting as an emetic.

Physiological Action.—Silver Nitrate combines with the albumin of the tissues and is a limited escharotic. It excites superficial inflammation, and stains the part black under the influence of light. The stains may be removed by washing with a strong solution of Potassium Cyanide.

In Small Doses it increases secretion. *Its Continued Administration* produces gastro-intestinal catarrh, waste of tissue, uræmia, albuminuria, fatty degeneration of the heart, liver and kidneys, hemorrhages, fluidity of the blood, a slate-colored line along the gums, and a similar discoloration of the skin and mucous membranes, with centric impairment of the nervous system, causing paralysis on a large scale, loss of coördination, convulsions, and finally death by paralysis of respiration. These symptoms are collectively termed *Argyria*.

Large Doses produce violent gastro-enteritis, and ulcer of the stomach, from thrombosis of its veins.

Regulation of a Course of Silver Medication.—The administration of the remedy should be suspended after five or six weeks, and elimination promoted by purgatives, diuretics and baths. To prevent the general

discoloration, Potassium Iodide may be given conjointly with the silver, though its value has not been proven.

Therapeutics of the Silver Salts.—Locally the Nitrate is much used as a stimulant application, an astringent, a caustic, an alterative, and an antiphlogistic. A solution in Nitrous Ether (gr. xl ad ʒj) will abort *Superficial inflammations*, if applied early to the neighboring integument. *Erysipelas*, by Higginbotham's method, the solution (gr. xx ad ʒj) applied over the inflamed surface and beyond, after careful washing and drying.

Throat Diseases, the Nitrate is used, but salts of Copper are better.

Ulcers of the tongue and tonsils, the solid stick may be applied locally.

Dyspepsia, with vomiting of yeasty fluid, the Nitrate internally.

Chronic Gastritis and Gastric Ulcer, the Oxide in $\frac{1}{2}$ -grain doses *ter die*.

The Nitrate may be combined with Belladonna or Hyoscyamus in chronic gastric catarrh, in which it is often very efficient.

Dysentery of chronic type, especially if rectal ulcer, the Nitrate internally and by enema, is one of the best remedies.

Diarrhœa, of phthisis and typhoid fever, the Nitrate with Opium.

Conjunctivitis, solutions of various strengths (gr. j-x ad ʒj of distilled water); when corneal ulcers exist, it must be cautiously used, or opacities due to deposits of the metal will remain in the cornea.

Chronic Spinal Inflammations, causing locomotor ataxia or paraplegia, the Nitrate has in some few cases effected permanent cures (?).

Epilepsy, was formerly much treated with the Nitrate, but without producing conclusive results.

Gonorrhœa, the Nitrate as injection, solutions of 1 in 2000 to 1 in 1000; or solutions of Argyrol, 1 to 3 in 1000, or of Protargol, $\frac{1}{4}$ to 2 per cent.

Ophthalmia Neonatorum, a 1 per cent. solution of the Nitrate instilled on the eye of the new-born infant, as a prophylactic.

CUPRUM—Copper

Salts and Preparations.—There is only one official salt, viz.:

Cupri Sulphas, Copper Sulphate (Blue Vitriol, Bluestone), very soluble in water. Dose, as an astringent, gr. $\frac{1}{8}$ – $\frac{1}{2}$ [av. gr. $\frac{1}{6}$]; as an emetic, gr. ij–v [av. gr. iv] every 10 or 15 minutes.

Alkaline Cupric Tartrate Volumetric Solution, Fehling's Solution, the official reagent for glucose in urine. See U. S. Phar.

**Cupri Acetas*, Copper Acetate, used locally. *Verdigris* is an impure acetate, or carbonate of copper, and is a violently irritant poison.

**Cuprum Ammoniatum*, Ammoniated Copper. Dose, gr. $\frac{1}{16}$ -j.

**Cupri Arsenis*, Copper Arsenite.

Treatment of Copper Poisoning.—Metallic Copper (as a penny), is best let alone; it will pass the anus in due time without serious symptoms. *Antidotes* to the copper salts are Potassium Ferro-cyanide and Albumin. Prompt evacuation by emetics or the stomach-pump is necessary. Then Potassium Iodide, even to saturation of the system, to promote elimination.

Physiological Action.—Copper Salts are gastro-intestinal irritants, causing a metallic taste, nausea with vomiting of greenish matters, purging of blood and mucus, constricted fauces, depressed heart action, hurried respiration and fever. Or, as in the case of Arsenic, no gastro-enteritis may occur, but instead profound nervous symptoms, as headache, defective coördination, coma and convulsions, ending in death.

Symptoms of chronic poisoning are bronchial irritation and catarrh, gastro-intestinal catarrh, colic with diarrhoea [*Lead*, colic with constipation], dysentery, nausea, waste of tissue, anæmia, salivation, and a green line (sulphide) along the margin of the gums in those who do not brush their teeth. Nervous symptoms are also usually marked. *Liver* becomes atrophied, from irritation of its connective tissue and fatty degeneration of the hepatic cells. *Lungs* are congested, even pneumonic consolidation being set up, Copper seeming to have a selective affinity for the parenchyma of these organs.

The Sulphate is a simple, irritant emetic, producing prompt and continued vomiting with but little nausea or depression. In small doses it is a nerve-tonic, and is astringent to the gastro-intestinal tract. Externally applied in solution it is a useful stimulant and astringent to diseased mucous surfaces, and is mildly caustic if used in substance. The Acetate is possessed of the same general action as the sulphate. Its local action is stimulant and escharotic. The impure acetate (*verdigris*) is a violently irritant poison. Ammoniated Copper has no special action other than that of the sulphate.

Therapeutics.—The Sulphate is the best emetic in:

Narcotic and Phosphorus Poisoning, also in *Croup*, gr. xij in \mathfrak{z} iv of water, a teaspoonful being given every 10 minutes until emesis.

Chronic Dysentery and Acute Diarrhoea, the Sulphate in doses of gr. $\frac{1}{16}$ - $\frac{1}{2}$ with Opium, is the best *metallic* astringent in these affections.

Fungous Granulations, Sulphate in fairly strong solutions.

Gastro-intestinal Catarrh, with diarrhoea, the Sulphate in small doses.

Throat Affections, in which weak solutions of the Sulphate are far superior to any other application, even to that of Silver Nitrate.

Granular Lids and Corneal Ulcers are best treated by a quick rub with a smooth crystal of the Sulphate once or twice a week.

Herpes, Eczema, etc., ointments or lotions of the Acetate.

Gonorrhœa, a weak solution of the Sulphate (gr. $\frac{1}{8}$ ad $\frac{3}{4}$) is a good injection after the acute inflammatory stage has passed.

Alga in Drinking Waters, Sulphate, 1 part to a million.

PLUMBUM—Lead

Salts and Preparations.—Lead is represented by 4 official salts, most of which are, however, only used externally.

Plumbi Acetas, Lead Acetate (Sugar of Lead), very soluble in water.

Dose, gr. ss-ij [av. gr. j].

Liquor Plumbi Subacetatis, Solution of Lead Subacetate, is used locally as an astringent and cooling lotion, diluted with an equal quantity of water.

Liquor Plumbi Subacetatis Dilutus, Lead Water, has of the preceding 4 in Distilled Water 96. For local use as a mild astringent and cooling application.

**Ceratum Plumbi Subacetatis*, Cerate of Lead Subacetate, has of the Solution 20 per cent., with Camphor, Wool-fat, Paraffin, and White Petrolatum.

Emplastrum Plumbi, Lead Plaster, has of the Acetate 60, Soap 100.

It forms the basis of many other plasters.

**Emplastrum Adhasivum*, Adhesive Plaster, has of Rubber 2, Petrolatum 2, Lead Plaster 96.

Unguentum Diachylon, Diachylon Ointment, has of Lead Plaster 50, White Petrolatum 49, Oil of Lavender Flowers 1.

**Plumbi Iodidum*, Lead Iodide, is used chiefly as an ointment. Dose, gr. $\frac{1}{8}$ twice daily.

**Plumbi Nitrates*, Lead Nitrate, soluble in 2 of water, and is used locally as an astringent and deodorizer in solutions up to 1 per cent., also as an escharotic and disinfectant.

Plumbi Oxidum, Lead Oxide (Litharge), insoluble in water, and is used with oil or as a plaster externally.

**Plumbi Carbonas*, Lead Carbonate (White Lead), insoluble in water or alcohol. A 10 per cent. ointment with 90 of Benzoinated Lard is used as a dressing for burns.

Incompatibles are very numerous; the Lead salts are best administered alone. The Acetate may be combined with Opium in pill, or with Laudanum as an astringent and anodyne lotion.

Physiological Action.—Astringency is the chief quality of the salts of Lead; they contract muscular tissue, and destroy its contractile power, also lessening secretion they cause colic and constipation. The heart is at first increased in power, but soon slowed, also the respiration. The nervous system is insidiously affected, obscure symptoms, as headache, loss of memory, vertigo, being soon manifested.

Acute Lead Poisoning is rare, the metal itself not being poisonous unless acted on by acids, and the Acetate in large doses being emetic. Intense gastro-intestinal irritation, vomiting, paralysis, coma, collapse, are its principal phenomena.

Chronic Lead Poisoning has its chief sources in pure water conveyed by leaden pipes, the use of hair dyes, printing type, etc. Its most prominent symptoms are the blue line (sulphide) along margin of gums, in those who do not clean their teeth, paralysis of the extensor muscles of the forearm (drop-wrist) impaired sensibility, rheumatism without fever or tenderness in the joints, which, however, are red and swollen, emaciation, albuminuria, colic, constipation, abortion, gastralgia, aphonia. *Death* may occur from extension of the muscular paresis to the muscles of respiration from the gradual impairment of nutrition; or from convulsions and coma, a form of the disease known as *Lead Encephalopathy*.

Treatment of Lead Poisoning.—*Acute poisoning*, as by the Acetate, of which ʒj is a toxic dose, the Sodium or Magnesium Sulphate is the antidote; then evacuate the stomach, and give albuminous drinks and Opium to allay irritation. *Chronic poisoning* is best treated by Iodides to saturation of the system, the Sodium or Calcium Iodide being the best. Sulphurated Potassa baths (ʒj or more, in water) are also very useful.

Therapeutics.—Lead is chiefly used as an astringent and hemostatic. *Skin Diseases*, especially eczema, lichen, impetigo, erythema, etc., the Liquor Plumbi Subacetatis, part j to iv of Glycerin and Water.

Catarrhal Discharges of muco-purulent character, from the ear, the vagina and the urethra, especially gonorrhœa and leucorrhœa.

Burns, of small extent, are treated by covering with White-lead paint.

Hemorrhages, as hematemesis, gastric ulcer, etc., the Acetate, in 3- to 5-grain doses, ever, 3 hours.

Diarrhæas are commonly treated with the Acetate; gr. ij with gr. j of Pulvis Opii, for choleraic diarrhœa, is good treatment.

Inflammations of external parts are constantly treated by the lotion of "Leadwater and Laudanum;" though the constituents are chemically incompatible, it is a valuable sedative and astringent. The sedative action is in the leadwater solely.

"Lead ought not to be employed externally or internally except for a short time, as otherwise symptoms of poisoning may arise" (Cushny).

ZINCUM—Zinc

Salts and their Preparations.

Zinci Acetas, Zinc Acetate, soluble in 3 of water. Dose, gr. ss-ij [av. gr. ij]; locally in solution of gr. j or ij to the ℥.

Zinci Carbonas Præcipitatus, Precipitated Zinc Carbonate, insoluble in water, but used locally as a protective.

Zinci Chloridum, Zinc Chloride, very soluble in water. It is used solely as an escharotic, or in solution as a disinfectant and deodorant for sick-rooms and water-closets.

Liquor Zinci Chloridi, Solution of Zinc Chloride, has 50 per cent. of the salt, and is used as a disinfectant for sinks, drains, etc.

**Zinci Iodidum*, Zinc Iodide, very soluble in water. Dose, gr. ss-ij [av. gr. j] in syrup.

Zinci Oxidum, Zinc Oxide, insoluble in water or alcohol. The Ointment has 20 per cent. of the Oxide, in 80 of Benzoinated Lard.

Zinci Phenolsulphonas, Zinc Phenolsulphonate, very soluble in water. Dose, gr. j-v [av. gr. ij].

Zinci Stearas, Zinc Stearate, insoluble in water or alcohol, but used locally as a dressing powder. The Ointment has 50 per cent. of the Stearate, with White Petrolatum.

Zinci Sulphas, Zinc Sulphate, very soluble in water, insoluble in alcohol. Dose, as a tonic and astringent, gr. $\frac{1}{10}$ -ij in pill; as an emetic gr. x-xx [av. gr. xv].

Zinci Valeras, Zinc Valerate, soluble in 50 of water. Dose, gr. $\frac{1}{4}$ -iv [av. gr. ij] in pill.

*The *Bromide* is described under BROMUM.

Physiological Action.—The salts of Zinc are astringents, but milder ones than the salts of Lead. Its soluble salts (the Chloride, Sulphate and Acetate) are corrosive poisons, causing violent gastro-enteritis, and in some cases profound nervous symptoms. The Chloride is a powerful and painful escharotic, having great affinity for water, and destroying the albumin of the tissues. The Sulphate is a specific emetic, acting promptly and without very much depression. Continued use of these salts produces symptoms similar to those of chronic Lead poisoning, but of less gravity. They do not manifest the same tendency to accumulate in the system as the salts of the other similar metals.

Therapeutics.—Zinc salts are used as weak and mild astringents in: *Gonorrhœa*, injection of the Sulphate (gr. j ad ʒj aquæ). *Conjunctivitis*, the Sulphate, with or without Atropine, as a collyrium. *Skin Diseases*, the Oxide and Acetate, as unguents and lotions. *Lupus*, *Epithelioma*, and other malignant growths, the Chloride as an escharotic, made into a paste with flour and glycerin. *Narcotic Poisoning*, the Sulphate, in a 6-grain dose, is the best emetic. *Diarrhœas and Dysentery*, the Sulphate with Opium and Ipecac, or the Oxide with Pepsin, are efficient, after clearing the intestinal canal. *Summer Diarrhœa* of children, the Oxide is an excellent remedy; may be given with Bismuth and Pepsin in powders. Caution. *Gastralgia*, the Oxide, gr. v-x, with Aromatic powder and Morphine, is often very efficient, if given half an hour before eating (?). *Night-sweats of Phthisis*, the Oxide, gr. iij, with Extract. Belladonnæ, gr. ss, at bedtime, is generally effective as a preventive. *Catarrhs* of mucous membranes, the Sulphate in weak solution locally. *Epilepsy*, *Neuralgia*, *Chorea*, *Hysteria* and *Nervous Headache* have been treated by the Oxide and the Valerate; especially the latter in the various anomalous nervous affections of hysterical women. The value of this treatment is seriously doubted.

ALUMEN—Alum

An Alum is a double Sulphate, formed by the union of a Sulphate of Aluminum, Chromium, Manganum or Ferrum, with a Sulphate of an alkaline metal or group (Potassium, Sodium, or Ammonium).

The Official Alum is *Aluminum and Potassium Sulphate*, or Potassium Alum, $\text{AlK}(\text{SO}_4)_2 + 12\text{H}_2\text{O}$, which becomes *Alumen Exsiccatum*, Dried Alum, when the 12 molecules of water are driven off.

Preparations.

Alumen, Alum, Potassium Alum, is soluble in 9 parts of water, very soluble in hot water. Dose, gr. v-x [av. gr. viii].

Alumen Exsiccatum, Exsiccated Alum, slowly soluble in 20 of water.

The only other official salt of Aluminum is the Hydroxid; the Sulphate, and the Silicate (Kaolin), having been deleted from the new edition of the Pharmacopœia.

Administration.—Being a double salt, Alum is very easily decomposed when in solution with other salts, the double decomposition which therein ensues giving rise to insoluble precipitates; therefore it is best administered alone. *Incompatibles* are salts of Iron, Manganese, Bismuth, Antimony, Lead, and salts of most of the alkaloids.

Physiological Action.—Alum is an astringent, stimulating muscular contraction and coagulating albumin. It first excites the flow of saliva, and then markedly diminishes it. Coagulating pepsin, it arrests digestion, also stops peristalsis, and usually causes constipation, though sometimes inducing diarrhœa.

In teaspoonful doses Alum is sometimes an efficient emetic. In large doses it is a gastro-intestinal irritant, $3\frac{1}{2}$ grs of dried Alum having caused the death of an adult in 8 hours.

Therapeutics.—It is used locally and internally. In:

Gastric Catarrh. Alum is useful, especially when there is vomiting of glairy mucus, in doses of gr. iv-vii, in pill, *ter die*, but should be employed with discretion.

Leucorrhœa, Gonorrhœa, injections of Alum with Zinc Sulphate or Borax, are commonly recommended, and are efficiently employed.

Hemorrhages of passive character are well treated by Alum, locally applied. *Hemorrhoids*, a crystal of Alum, shaped to fit the rectum.

Croup, Alum is a good emetic, though Ipecac is better.

Bed-sores, Alum 1 part with 2 of Spiritus Camphoræ and the whites of four eggs, is a very efficient application.

Ulcers, Sores, etc., when exuberant granulations, burnt Alum as a caustic.

Colliquative Sweats, an Alum lotion sponged over the skin.

Catarrhal Ophthalmia, after acute stage, an Alum lotion, gr. v to the $\frac{3}{4}$.

Granular Lids, a crystal of Alum is one of the best applications.

CERII OXALAS—Cerium Oxalate

Physiological Action.—The Oxalate has a slightly metallic taste and is said to be sedative to the stomach. It consists chiefly of a mixture of the

oxalates of Cerium, Didymium, and Lanthanum, and other rare earths of the same group. It occurs as an insoluble white powder, and is given in doses of gr. ss-v [av. gr. j], in pill or powder.

Therapeutics.—Cerium Oxalate was introduced by Sir James Simpson as a remedy for vomiting, especially that of pregnancy, but has since been proven to be quite without value. The oxylate is insoluble and is not absorbed from the alimentary tract.

CEREBRAL DEPRESSANTS

This group includes drugs which are often classed as Anæsthetics, Narcotics, Somnifacients, Cardiac Stimulants, and Motor Depressants (the Bromides)

ALCOHOLS and ALDEHYDES

An Alcohol is a volatile organic compound of an organic radicle and Hydroxyl (HO), contains no N, has a great affinity for water, and reacts with acids to form H_2O and Ethers. Alcohols are therefore analogous to the metallic hydroxides, and Ethers to metallic oxides or salts.

An Alcohol is obtained by distillation from the fermented product of grape-sugar, or some substance (as starch) easily converted into grape-sugar, which in the presence and by the growth of certain low vegetable organisms (the yeast plant, etc.) splits up into Alcohol and CO_2 . It may also be made synthetically by shaking Olefiant Gas (C_2H_4) with strong Sulphuric Acid, then diluting and distilling. $C_2H_4 + H_2O = C_2H_5O$, Ethylic Alcohol.

Three Important Alcohols are the following-named, viz.:

Ethyl Alcohol, $C_2H_5 + HO = C_2H_5O$, Ethyl Hydroxide, Grain Spirit, the official "Alcohol." Its products depend upon the rate of its oxidation. If very slowly it forms Aldehyde, C_2H_4O , if more quickly Acetic Acid, $C_2H_4O_2$, if very quickly, as in burning, CO_2 and H_2O , which are, in all cases, the ultimate products of its continued oxidation.

Methyl Alcohol, $CH_3 + HO = CH_3O$, Methyl Hydroxide, Wood Spirit.

One of the products of its oxidation is Methylal (see under CHLORAL).

Amyl Alcohol, $C_5H_{11} + HO = C_5H_{11}O$, Amyl Hydroxide, Fusel Oil, Potatospirit, also occurs in the excessive distillation of fermented grain, along with the Ethyl Alcohol. Its oxidation produces Valeric Acid, $C_5H_{10}O_2$.

An Aldehyde is obtained from an alcohol by removing two atoms of hydrogen, hence its name—*al(cohol)dehyd(rogenatum)*. Aldehydes lie in chemical constitution between the alcohols and the acids, and have the power of reducing silver salts in darkness, which is shared also by living protoplasm. The principal aldehydes are:

Acetic Aldehyde, C_2H_4O , Aldehyde, Ethyl Aldehyde, Ethylidene Oxide, a colorless, mobile liquid, antiseptic, locally irritant, anæsthetic when inhaled, and a powerful depressant of the respiration, too dangerous for use.

Paraldehyde $C_6H_{12}O_3$, a polymeric form of Aldehyde, and a valuable hypnotic (see under CHLORAL).

Formic Aldehyde, Formaldehyde, CH_2O , is a gaseous body prepared by subjecting methyl alcohol to oxidation. It is described under its own title.

A Ketone bears the same relation to an Aldehyde that an Ether does to an Alcohol, being an aldehyde in which the hydrogen has been replaced by a radicle. The most important Ketone is:

Hypnone, $C_6H_5(CO)(CH_3)$, Phenyl-methyl-acetone. A moderate hypnotic (described under CHLORAL).

Official Preparations of Alcohol.—The official alcohol is Ethyl Alcohol, which is represented in the pharmacopœia under the following three forms, viz:

Alcohol Dehydratum, Absolute Alcohol, is Ethyl Alcohol, containing not more than 1 per cent. by weight of water, and having a specific gravity not higher than 0.797 at 59°F. Used in the manufacture of Chloroform.

Alcohol has about 92.3 per cent. by weight, or 94.9 per cent. by volume of Ethyl Alcohol, and about 7.7 per cent. of water; specific gravity 0.816 at 60°F.

Alcohol Dilutum, Diluted Alcohol, has about 41.5 per cent. by weight, or 48.9 by volume of absolute Ethyl Alcohol, and about 58.5 per cent. of water; specific gravity about 0.936 at 60° F. Prepared by mixing together equal volumes of Alcohol and Distilled Water.

Unofficial Alcoholic Preparations having no medicinal value.

**Spiritus Frumenti*, Whisky, obtained from the distillation of the mash of fermented grain; rye, wheat, corn, or barley, and at least 4 years old. Alcohol strength 37 to 47.5 per cent. by weight; also has Ethers developed by the action of acetic and butyric acids on the alcohol, and traces of fusel oil even in the best. Dose, ʒj-ʒij.

- **Spiritus Vini Gallici*, Brandy, obtained by the distillation of the fermented juice of grapes, and at least 4 years old. Alcoholic strength 39 to 47 per cent. by weight, also contains Ceanthie and other Ethers developed by age. Pale Brandy is colored by the cask alone; dark has caramel added. Brandy is often prepared artificially by adding to high wine (Alcohol) Acetic or Nitric Ether, Caramel, and Logwood or Catechu for astringency. Dose, ʒj-ʒij.
- **Vinum Album*, White Wine, should contain 7 to 12 per cent. by weight of absolute alcohol, and is made by fermenting the unmodified juice of the grape, freed from seeds, stems and skins. California Riesling, Ohio Catawba, etc. Dose, ʒss-iv.
- **Vinum Rubrum*, Red Wine, is made by fermenting the juice of colored grapes with their skins. It should contain 7 to 12 per cent. by weight of absolute alcohol. Native Claret, Burgundy, etc. Dose, ʒss-iv.
- **Spiritus Rectificatus*, Rectified Spirit (official in the B. P.), has 90 per cent. by volume of absolute alcohol, and 10 per cent. of water. It is often spoken of as "56 over proof," meaning that to reduce 100 volumes of it to the strength of proof spirit requires 56 volumes of water.
- **Proof Spirit* is Alcohol of the specific gravity 0.920; if lighter it is said to be "above proof," if heavier it is "under proof."
- **Rum* is obtained by the distillation of fermented molasses.
- **Gin* is distilled from rye or barley, and flavored in Holland with Juniper berries and Hops; in England often with Oil of Turpentine, various cheap aromatics, Lead Acetate, Zinc Sulphate, Cayenne Pepper, etc. Pure Gin is diuretic, from the Oil of Juniper contained in it, but other diuretics are better employed.
- **Vinum Portense*, Port Wine, has 30 to 40 per cent. of alcohol. Is almost impossible to be obtained pure, being usually made artificially and heavily fortified with Alcohol.
- **Vinum Xericum*, Sherry, a dry spirituous wine, also generally made to order by the so-called rectifiers; the process being one of slow heating. Has of absolute alcohol from 20 to 35 per cent.
- **Sparkling Wines*, Champagne, etc., are sweet, being bottled before fermentation has ceased; have 8 to 12 per cent. Alcohol and considerable CO₂.
- **Sweet Wines*, Burgundy, Tokay, Muscatel, Malaga, Angelica, Madeira, etc., are of low Alcoholic strength, 6 to 7 per cent., unless fortified.
- **Light Red Wines*, Claret, Red Rhine, Concord Port, have 5 to 6 per cent. Alcohol, Tannic Acid, grape coloring matter, etc.

**Dry Acid Wines*, Rhine, Moselle, Ohio, Catawba, etc., in which fermentation is completed. Alcohol strength 5 to 7 per cent.

**Beer*, by slow fermentation, yeast falling, Alcohol 2 to 3 per cent.

**Ale*, by rapid fermentation, yeast floating, Alcohol 2 to 6 per cent.

**Porter, Stout*, has much coloring matter, Alcohol 4 to 6 per cent.

These three contain also extract of malt, CO_2 , lactic acid, salts of potassium and sodium, aromatics, etc.

**Kumyss* is obtained by the fermentation of Milk, that of the mare being used in Tartary. It contains from 1 to 3 per cent. of alcohol, besides sugar, lactic acid, casein, fat, salts, carbon dioxide and ethers.

Physiological Action.—Alcohol is a cerebral depressant, and a narcotic poison. It is anæsthetic, antiseptic, and anti-parasitic, a mild counter-irritant, and coagulates albumin by abstracting its water. It is very diffusible, partly oxidized by the organism, partly excreted. In small doses it relaxes the vessels, irritates the gastric glands, lessens the elimination of waste products (urea and CO_2), causes a subjective sensation of heat, though it lowers the body temperature. It may briefly stimulate the heart reflexly, prolonging its systole and reducing the length of the diastole. A portion is oxidized by the organism (3jss in 24 hours?), yielding force, which is thought by some to economize nervous, muscular and glandular power.

The long-continued use of moderate doses congests the stomach and liver, over-irritates the gastric glands and the hepatic cells to the production of pathological secretions, causes gastric catarrh and morning vomiting, and impairs digestion. By irritation it sets up hyperplasia of the submucous connective tissue (sclerosis), especially in the stomach, brain, kidneys and liver (cirrhosis); produces fatty degeneration (steatosis) of the arterial walls, and the various organs; and depresses the heart and the arterial tension. Epilepsy, paraplegia, amaurosis and insanity may result from the long-continued use of spirits, Alcohol having an especial affinity for the nervous system. The malt liquors (beer, ale, etc.) are less prone than the spirituous to affect the brain, but are apt to set up fatty degeneration of the liver and heart.

In large doses Alcohol precipitates pepsin and destroys its activity as a ferment, arrests digestion, produces intoxication, hallucinations, delirium, muscular incoördination, depression of the heart, lowered arterial tension and body temperature, abolished reflexes and coma. *A Toxic Dose*, after a very brief period of excitement, produces insensibility, ster-

torous breathing, dilated or contracted pupils, complete muscular relaxation, and death by paralysis of the heart and respiration.

Alcohol is a food within narrow limits; $\frac{3}{4}$ jss per diem (?) is the quantity which the adult organism can oxidize; more than this is a poison, setting up structural changes in the organs, and lowering the resistance power of the body to morbid influences. It has frequently caused an intractable form of phthisis. The very young and the very old bear more Alcohol relatively than the adult.

Morbid Conditions with which Acute Alcoholism may be Confounded.—Apoplexy, opium narcosis, concussion of the brain, uræmia, epilepsy, and even acute pneumonia. The differential diagnosis is difficult to make in the state of deep coma. The pupils are not a trustworthy indication, as in alcoholism they may be either dilated or contracted. Alcohol usually imparts a characteristic odor to the breath.

Treatment of Acute Alcoholism.—Evacuate the stomach, *Ammonia* inhalation cautiously, warmth to the extremities, cold affusion to the head, faradism of the muscles of respiration. Milk, black coffee, mucilaginous drinks afterward. Nutritious digestible diet in liquid form, and small quantities frequently repeated. *Hydrated Chloral*, gr. xx-xxx, well diluted, and repeated at intervals of 2 or 3 hours to procure sleep; or Paraldehyde in doses of 1 drachm.

Therapeutics.—Though decidedly injurious in health, in disease Alcohol may be used in some cases. In:

Vomiting of yellow fever, sea-sickness, etc., Iced Champagne has been used, but a carbonated water may be just as useful.

Bed Sores, if threatening, Alcohol locally, to harden the tissue. This would seem to be about the only real indication for the use of Alcohol in Therapeutics. Internally, the drug is more harmful than beneficial. All the indications for Alcohol formerly recommended can be far better met with simpler, non-toxic measures.

Diphtheria, dilute Alcohol sprayed into the throat.

ÆTHER—Ether

The substance improperly called "Sulphuric Ether" or "Ether" is *Ethyl Ether*, or *Ethyl Oxide*, C_2H_5O , and is a derivative of Ethyl Alcohol, prepared by its distillation with Sulphuric Acid, the latter body dehydrating the Alcohol and remaining in the retort. $(C_2H_5O)_2 - H_2O = C_2H_5O$.

Properties.—Ether is a volatile, colorless, inflammable liquid, composed of about 96 per cent. of absolute Ethyl Oxide and about 4 per cent. of Alcohol containing a little water. Its specific gravity is 0.725 to 0.728 at 59°F., therefore it is lighter than water, but its vapor is heavier than air, with which it forms an explosive mixture. It evaporates speedily in the open air, with the production of cold. When good, it evaporates from the hand, without leaving behind a disagreeable odor. Its odor is strong and characteristic, its taste hot and pungent. It dissolves oils, fats, resins, caoutchouc, most of the organic alkaloids, and many other substances. Dose, internally, ℥x-xxx [av. ℥xv], in syrup; hypodermically, for heart-failure, ℥x-xx. It is best prescribed as the Spirit of Ether, which mixes readily with water.

Other Ethers used in Medicine are:

- **Ether Aceticus*, Acetic Ether (Ethyl Acetate), an inflammable liquid, of ethereal and acetous odor; used in Cologne-water, and Tinct. Ferri Acetatis. Dose, ℥x-xxx [av. ℥xv].
- **Hydrobromic Ether*, Ethyl Bromide, is not inflammable. Dose, internally and hypodermically, ℥x-xxx.
- **Hydriodic Ether*, Ethyl Iodide, non-inflammable and insoluble in water. Dose, by inhalation, ℥xv.
- **Nitrous Ether*, Ethyl Nitrite, $C_2H_5NO_2$, is properly a nitrite. A 4 per cent. solution in alcohol is the well-known diuretic and diaphoretic, *Spiritus Etheris Nitrosi*, Spirit of Nitrous Ether, Sweet Spirit of Nitre. Dose, ℥x-3ij [av. ℥xxx].
- **Sulphuric Ether* (properly so called) is Ethyl Sulphate, $C_2H_5SO_4$.

Preparations.

- **Oleum Ethericum*, Ethereal Oil, consists of equal volumes of heavy oil of wine and ether. As it occurs in commerce it is usually worthless.
- **Spiritus Etheris*, Spirit of Ether, has of Ether $\frac{1}{8}$, Alcohol $\frac{3}{8}$. Dose, ℥x-3ij [av. 3j].
- **Spiritus Etheris Compositus*, Compound Spirit of Ether (Hoffman's Anodyne), contains Alcohol 65, Ether $32\frac{1}{2}$, Ethereal Oil $2\frac{1}{2}$. Dose, ℥v-3ij [av. 3j].
- **Anæsthetic Mixtures* have Ether 3 parts, Chloroform 2 or 1, Alcohol 1.

Physiological Action.—Ether is anodyne, antispasmodic, and anthelmintic, a cardiac stimulant primarily, an anæsthetic, and a narcotic poison. On the cerebrum and the motor and sensory nerves, its action is similar to that of alcohol, but more prompt and less protracted. It is eliminated quickly, chiefly by the lungs.

Inhaled, it produces at first faucial irritation, a sense of strangulation, and cough, then a stage of excitement (cerebral intoxication), in which the face is flushed and the respiration and pulse are quickened. A tetanic convulsive stage generally follows, the face being cyanosed, the muscles rigid, the respiration stertorous. This soon subsides, and complete insensibility is established, the muscles being relaxed, and the reflexes abolished. The cerebral functions are suspended, the lower centres in the medulla continuing to carry on the processes of respiration and circulation. If the inhalation be continued these too become paralyzed, death usually resulting from slow paralysis of respiration, the heart pulsating long after breathing has ceased. *Atropine* hypodermically is the best antagonist to the toxic effects of Ether.

Nitrous Ether is a mild diaphoretic, a carminative, and diuretic; and a diffusible stimulant, like the nitrites in general action.

Therapeutics.—When diluted with Alcohol, as in the Spirit, Ether mixes readily with Water, and may be administered internally in: *Gastralgia, Colic, Flatulence, etc.*, the Compound Spirit is admirable.

Hepatic Colic, the compound Spirit is sedative.

With Opium, to counteract the drying effects of that drug.

Syncope is promptly met by the Compound Spirit (?).

Hysteria, the paroxysms and flatulence, are quickly relieved by Ether.

Cholera, the algid state, Ether has been used subcutaneously.

Neuralgia, Ether injected into the vicinity of the affected nerve.

Local Anæsthesia by Ether-spray affords relief in neuralgia of superficial nerves, lumbago, spinal irritation, chorea; and in minor surgical operations it is a valuable method, but now displaced by Cocaine.

As a General Anæsthetic Ether is less prompt in action but much safer than Chloroform, as it never paralyzes a healthy heart. It has its necrology, however, many deaths being reported as undoubtedly caused by it, besides, several which occurred some hours after its anæsthesia. Ether should be inhaled in a diluted form and should be kept warmed to the body temperature. If a light be in the room it should be high above the patient. A grate-fire or gas-stove in the vicinity is very dangerous.

CHLOROFORMUM—Chloroform

Chloroform is Trichloro-methane, CHCl_3 , prepared by the action of Chlorinated Lime upon Alcohol. It was discovered by Samuel Guthrie, of Sackett's Harbor, N. Y., in 1831.

Properties.—It is a colorless, neutral fluid, practically non-inflammable, soluble in alcohol, ether, olive oil and turpentine, and in 200 of water. Its density and weight are about four times those of air, and its specific gravity not below 1.490 at 59°F. It consists of 99 to 99.4 per cent. by weight of absolute Chloroform and 0.6 to 1 per cent. of Alcohol. It dissolves caoutchouc, gutta percha, oils, fats, resins, many of the balsams, and most of the alkaloids. Dose, internally, ℥j-℥ [av. ℥v]; by inhalation ℥ss-j, mixed with air and repeated until anæsthesia.

Preparations and Derivative.

Aqua Chloroformi, Chloroform Water, a saturated solution, containing about 0.5 per cent. Dose, ℥j-℥j [av. ℥iv].

Emulsum Chloroformi, Emulsion of C. Dose, ℥j-iv [av. ℥ij].

Spiritus Chloroformi, Spirit of C., 6 per cent. Dose, ℥x-℥j [av. ℥xxx].

Linimentum Chloroformi, 30 per cent. in Soap liniment 70.

**Linimentum Chloroformi Compositum*, Compound Chloroform Liniment, Chloroform 1, Oil of Turpentine 1, Laudanum $\frac{1}{2}$, Tinct. Aconite, $\frac{1}{4}$, Soap Liniment 2 parts by volume. An excellent anodyne application.

**Chlorodyne*, Chlorodyne, a secret and very dangerous proprietary preparation, containing Chloroform, Ether, Morphine, Cannabis Indica, Hydrocyanic Acid, Treacle, etc. Dose, ℥v-xxx. Imitations are prepared by several manufacturing drug-houses, and are sold under the names *Chloranodyne*, *Elixir Chloroformi Compositus*, etc. A comparison of the published formulæ of ten different samples, shows that they contain Morphine in various proportions, namely from $\frac{1}{4}$ gr. to $8\frac{1}{2}$ grains in the fluid ℥; or, taking the average dose at ℥xv, the contained quantity of Morphine would vary from gr. $\frac{1}{128}$ to gr. $\frac{1}{4}$ per dose. A similar preparation is official in the British Pharmacopœia, under the title *Tinctura Chloroformi et Morphina Composita*, of which each 10-minim dose contains ℥ $\frac{3}{4}$ of Chloroform, gr. $\frac{1}{11}$ of a Morphine salt, and ℥ $\frac{1}{2}$ of Dilute Hydrocyanic Acid, with other ingredients.

**Anæsthetic Mixtures.*—That of Nussbaum has of Ether 3 parts, Chloroform 1, Alcohol 1. Another, much used, contains of Ether 3 measures, Chloroform 2, Alcohol 1.

**Chlorethane*, Acetone Chloroform, is obtained by the action of Potassium Hydroxide on equal weights of Acetone and Chloroform. It is soluble in alcohol, ether, and chloroform, and is hypnotic, antispasmodic, anæsthetic, and antiseptic, also narcotic in over-dose. In moderate doses it promptly relieves gastric irritability, and prevents the nausea and vomiting due to ether or chloroform inhalation. As a hypnotic it is

valuable in insanity and in cases of insomnia unattended with pain, high fever, or much nervous excitement. In epilepsy it has been used with benefit, and it is frequently employed with Cocaine for the production of spinal anæsthesia by sub-arachnoid injection, also in a 1 per cent. solution as a local anæsthetic application in ulcers and wounds. While large doses (3j-3vj), have been taken without ill effects, it is considered by many authorities to be a dangerous narcotic in doses over 30 grains. Dose, gr. v-xxx.

Action of Chloroform Compared with that of Ether.—Chloroform is much more irritant to the mucous membranes, and causes violent gastro-enteritis if swallowed undiluted. It is less of a stimulant, and more depressant to the heart and circulation. It clots the blood outside the body, making a mass like sealing-wax. In dose of 3j internally, it may cause death. By inhalation it is considered much more dangerous than Ether, its vapor requiring admixture with 96½ per cent. (?) of air to produce anæsthesia with safety. Its vapor is less irritant, however, to the air passages, uninflam-mable, more pleasant, more prompt in action, has a shorter stage of excitement, and a more profound narcosis, and does not cause so much vomiting. Its mortality is much greater, being about 1 in 3000, against 1 in 10,000 for Ether, and fatal cases are constantly reported, none of which, however, were in obstetrical practice. Its possible after-effect on the liver is much more marked.

The results of the labors of the Hyderabad Chloroform Committee show that both these agents act in the same manner upon the heart and respiration, paralyzing the latter first, but Chloroform acting more quickly and powerfully than Ether in both directions. Prior to this investigation it was taught that death from Chloroform inhalation is almost always sudden, and by cardiac paralysis, from Ether, slow and usually by paralysis of respiration.

Modes of Dying from Anæsthetic Vapors.—(1) Death may occur early in the inhalation, from sudden paralysis of the cardiac ganglia. Or by a small quantity of Chloroform given for minor operations the functions of the cerebral hemispheres may be suspended, but not those of the basal or med-ullary ganglia, permitting the irritation of a sensory nerve (especially the 5th) to transmit reflex inhibition over the pneumogastric upon the heart, thus arresting the action of its motor ganglia. The state of incomplete anæsthesia is always a dangerous one in which to perform any operation,

especially when the 5th nerve is implicated therein, as in the extraction of teeth.

2. In the stage of rigidity, from fixation of the respiratory muscles, the blood backing up on the venous side and arresting the heart's action.

3. In the stage of complete relaxation, by paralysis of respiration; or by paralysis of the tongue, causing obstructed respiration.

4. In the same stage, by paralysis of the cardiac ganglia.

5. From depression of the functions, or shock, in the anæsthetic state, or afterward.

Contra-indications for the Use of Anæsthesia.—Fatty degeneration or dilatation of the heart, kidney disease, emphysema of the lungs, very enlarged tonsils, tumor of the brain, and chronic alcoholism—particularly the first and last named.

Treatment of Dangerous Symptoms.—The vapor should be withdrawn and the patient inverted, head downward, if cardiac failure occurs. Drawing the tongue forward, artificial respiration, and faradization of the respiratory muscles, if breathing ceases. Warmth to the body and limbs. *Atropine* by hypodermic injection.

If swallowed, the stomach should be evacuated, and the case treated as one of poisoning by an irritant. There is no chemical antidote.

Therapeutics of Chloroform.—It is used for the same conditions as is Ether, and is much employed locally in liniments, as a rubefacient and anodyne, as in:

Rheumatic and Neuralgic Pains of chronic character, with Oil of Turpentine or Camphor, in a soap liniment. See *Linim. Chlorof. Comp.*, page 105.

Cholera, the Spirit, or Chlorodyne, has been helpful in true cholera in combination with opiates.

Respiratory Neuroses, as hay fever, spasmodic asthma, reflex cough, etc., the vapor of 3j of the Spirit inhaled from hot water.

Sciatica, Tic-douloureux and other neuralgiæ of important nerves, the deep injection of Mv-xv (?) of pure chloroform into the vicinity of the nerve is most efficient treatment (Bartholow). In my only case it caused dangerous local disturbance (H. C. Wood).

As an Anæsthetic its use is lessening every year in favor of Ether, except in obstetrical practice and for young children. Its vapor being four times denser and heavier than air, and its effective use requiring not more than 3½ per cent. of Chloroform vapor, its administration requires

most careful management. Dr. Sayre ignored the foregoing rule and always shut off all atmospheric air, claiming a more complete anæsthesia from a very small quantity (M_{xv-xx}) of Chloroform.

A subcutaneous injection of Morphine, gr. $\frac{1}{6}$, and Atropine, gr. $\frac{1}{120}$, 20 minutes before commencing the inhalation, is a means of some utility in sustaining the heart and respiration, and in rendering the anæsthesia more profound. This plan, however, is condemned by some anæsthetists.

ÆTHYLIS CHLORIDUM—Ethyl Chloride

Ethyl Chloride is Monochlor-ethane, C_2H_5Cl , a haloid derivative prepared by the action of hydrochloric acid gas upon absolute ethyl alcohol. It is extremely volatile and should be preserved in hermetically sealed glass tubes, and kept in a cool place, remote from lights or fire.

Physiological Action and Therapeutics.—Ethyl Chloride is increasing in popularity as a general anæsthetic for minor operations, dental surgery, reduction of fractures and luxations, curettement, parturition, and examinations of sensitive subjects, especially children; also as a preliminary inhalation to prevent the early excitant effects of ether or chloroform. It acts rapidly, anæsthesia being usually complete within a minute or two, and its risks are considered slight, even in patients with unsound heart or lungs. It does not relax the muscles, and in operations requiring complete relaxation its use should be followed by that of ether or chloroform. Its mortality is stated at 1 in 15,000 cases. It may give rise to erotic sensations resulting in false accusations, and should not be used for women except in the presence of a witness. It is used with exclusion of atmospheric air.

It may also be used advantageously as a local anæsthetic, being directed in a fine spray on the part which it rapidly freezes.

CHLORALUM—Chloral

Chloral itself is Tri-chlor-aldehyde (C_2HCl_3O), an unstable, oily, colorless fluid, formed by the action of Chlorine upon Alcohol. Its Hydrate, the official *Chloralum Hydratum*, Hydrated Chloral ($C_2HCl_3O + H_2O$), is a white crystalline solid, soluble in alcohol, water, and glycerin, and decomposed by alkalies into chloroform and a formate of the alkaline base.

Dose of Hydrated Chloral varies much with individual susceptibility and with the presence or absence of cardiac and pulmonary disease.

An average dose for a healthy adult may be placed at gr. xv-xx; for a child gr. j for each year of age, up to gr. vj. It is best given in Syrup of Tolu, and should be well diluted. Poisonous symptoms have followed the administration of gr. xxx, and in one case after only gr. vijss. When tolerance has been established by habitual use, as much as ʒij have been taken daily, for months.

Derivatives and Analogues of Chloral

Chloralformamidum, Chloralformamide (Chloralamide), is a crystalline solid, made by the union of chloral and formamide. It is soluble in about 20 of water and in $1\frac{1}{2}$ of alcohol, and is decomposed in warm or hot solutions. Dose, gr. x-xxx [av. gr. xv], in whisky or brandy.

Paraldehydum, Paraldehyde, $C_6H_{12}O_3$, is a polymeric form of acetaldehyde, obtained by treating the latter with dilute sulphuric acid. It is a pungent fluid, of somewhat unpleasant odor and taste, soluble in $8\frac{1}{2}$ of water, and miscible, in all proportions, with alcohol, ether and oils. It is a reliable hypnotic, fully equal to Chloral, but of shorter action, requiring more frequent repetition to produce sustained sleep. It is unquestionably safer than Chloral, as in medicinal doses it slows and strengthens the heart, and leaves no unpleasant after-effects, except a disagreeable odor to the breath. In very large dosage it is paralyzant to both heart and respiration. It occasionally causes an erythematous eruption, and may give rise to cerebral congestion and vaso-motor paralysis, if used for any long period. Dose, ℥xx-ʒij [av. ℥xxx], in syrup, etc., ʒj being about the average hypnotic dose for an adult.

Sulphonmethanum, Sulphonmethane (Sulphonal), is diethylsulphonedimethylmethane, produced by the oxidation of mercaptol obtained by the condensation of acetone with ethylmercaptan. It is a white, crystalline powder without odor or taste, very slightly soluble in cold water, more so in warm water, and still more so in alcohol, ether, etc. The dose is gr. x-xxx [av. gr. xv], in hot milk, soup, etc., 2 hours before its hypnotic action is required. It may cause toxic symptoms, especially when used for a prolonged period, its chief symptoms being disturbance of digestion, shown by vomiting and diarrhoea or constipation; disturbances of the nervous system, as ataxy and feebleness of the limbs, ptosis and ascending paralysis; also ischuria and oliguria, sometimes albuminuria or hæmatoporphyrinuria. In order to secure elimination and to guard against cumulative

action and consequent toxicity, its administration should be interrupted from time to time, and the patient taking it should be frequently purged.

Sulphonethylmethanum, *Sulphonethylmethane* (*Trional*), is diethylsulphone-methylethylmethane, a product of the oxidation of the mercaptol obtained by the condensation of methylethylketone with ethyl mercaptan. It occurs in lustrous, bitter crystals, soluble in 320 of cold water, readily soluble in hot water, in alcohol and in ether. It is an efficient hypnotic, prompter in action and less liable to produce ill effects than Sulphonal, but must be given in doses fully as large, gr. x-xxx [av. gr. xv]. An excellent hypnotic combination is obtained by mixing Trional and Sulphonal, gr. x-xv of each, the former giving early sleep and the latter securing later sleep.

Æthylis Carbamas, *Ethyl Carbamate* (*Urethane*), is an ester of carbamic acid, obtained by the reaction of ethyl alcohol upon carbamide (urea) or one of its salts. It occurs in colorless crystals, readily soluble in water, alcohol, ether, or glycerin. It is a pure hypnotic, but not so reliable as paraldehyde or chloral; neither does it affect the circulation nor depress (but rather stimulates) the respiration. It acts directly on the cerebrum, causing a sleep which closely resembles the normal, and has no unpleasant after-effects. In very large doses it slows the heart, lowers the temperature, and induces muscular resolution and general anæsthesia. In small animals it effectually antagonizes the action of Strychnine. Dose, gr. v-xxx [av. gr. xv]; but is best given in doses of 5 grains frequently repeated, up to 20 grains or more as a full dose may cause vomiting. It is incompatible with many substances, and is best administered by itself. Very inconstant in its effects.

***Butyl-chloral Hydras**, *Butyl-chloral Hydrate*, *Croton Chloral* (B. P.), is a crystalline body formed by acting on Aldehyde with Chlorine. It is sparingly soluble in water (1 in 50), but is readily so in glycerin. In action it closely resembles Chloral, but is feebler, less depressant to the heart, and generally less poisonous, but more disagreeable to the taste. Its action is so much like Chloral as to be superfluous in *Materia Medica*. Dose, as hypnotic, gr. v-xx.

***Amylene Hydrate**, *Dimethyl-ethyl-carbinol*, a tertiary alcohol, occurring as a clear, colorless fluid, of peculiar odor, soluble in 8 of water and readily miscible with alcohol. It is one of the most valuable hypnotics, in power standing between chloral and paraldehyde, but being much more agreeable to the taste and safer than either of those agents. Its action

is exerted chiefly on the cerebrum in doses sufficient to produce profound narcosis; and in medicinal doses it leaves behind no unpleasant effects, and has no perceptible influence on the heart or respiration. By very large dosage the medullary centres are paralyzed, including those governing respiration and cardiac action. It is less certain in its action than chloral. Dose, \mathfrak{zj} – \mathfrak{zjss} .

***Hypnal** is a combination of Antipyrine and Chloral, occurring as tasteless and odorless rhombic crystals, soluble in 6 of water, and credited with simultaneous action as a hypnotic and analgesic. Dose, gr. xv–xxx in aqueous mixture with some alcohol, flavored with syrup of orange. It is said to cause no gastric disturbance. Although Chloral and Antipyrine are incompatible with each other, they form, when heated together, the above-described compound, which resembles both and yet differs from each.

***Hypnone, Phenyl-methyl-acetone**, a member of the Ketones (see *ante*, page 99), occurring above 70°F. as a colorless, mobile liquid, having a strong almond and orange odor. It is insoluble in water or glycerin, and is best given in capsules. It is a hypnotic, of only moderate intensity, but said to be especially useful in the insomnia of alcoholism. Its use is devoid of danger, and leaves behind no unpleasant effects, except a disagreeable odor of the breath, the drug being eliminated by the lungs as well as by the kidneys. In very large dosage it has induced coma, followed by paralysis of the heart and respiration. Dose, \mathfrak{Mv} – \mathfrak{x} , in capsule, \mathfrak{Mvij} to \mathfrak{Mviij} being usually required.

***Methylal, Methylene-di-methyl Ether**, one of the products of the oxidation of Methylic Alcohol, occurring as a volatile, mobile liquid, of pleasant, aromatic odor and taste, readily soluble in water, alcohol, etc. It is a local anæsthetic, and an efficient hypnotic, producing a deep sleep of short duration, with more or less general anæsthesia and lowered reflex excitability. It is depressant to the heart, respiration and body temperature, but in medicinal doses does not leave any bad after-effects. Dose, \mathfrak{Miv} – \mathfrak{v} , repeated thrice at short intervals.

***Somnal** is formed by the union of Chloral, Alcohol and Urethane, occurring as a colorless liquid, resembling chloroform in its behavior with cold water, refusing to mix or dissolve, and forming globules therein. It is soluble in alcohol, in alcoholic solutions and in hot water. Doses of 45 and even 60 minims produced no depression of the circulation or respiration. In doses of \mathfrak{zss} its action is usually very prompt, the dose is well

borne always, easily taken (in a little syrup of tolu or whisky), and entirely without deleterious effect. The effects are much more striking and certain than those of Urethane and less depressing than those of Chloral; and there is no vertigo or depression, as may follow the use of Sulphonal.

These last four preparations are all superfluous.

***Veronal, Diethyl-malonyl-urea**, is a white, crystalline powder, of faintly bitter taste, soluble in 145 of water, and in 12 of boiling water. Dose, gr. v-xv, an average dose being gr. viijss, in some hot liquid, or in cachet, or as a powder. It is a very efficient hypnotic in dose of 8 to 10 grains, given in some hot liquid when a rapid action is required. It induces a practically normal sleep, does not affect the heart, circulation or kidneys, and is free from after-effects. It is particularly efficient when mixed with Sulphonethylmethane (Trional) in the proportion of two parts of the former to one of the latter (gr. viij with gr. iv, or gr. x with gr. v). It sometimes causes some motor incoördination, especially of the lower extremities, also an erythematous eruption and neuralgia, and is said to diminish the solid and urinary excretions.

Physiological Action of Chloral.—Hydrated Chloral is essentially a hypnotic, also a depressor of the cerebro-spinal centres, an antispasmodic, antiseptic, antiferment, counterirritant; prevents the coagulation of fibrin. It is more hypnotic than Chloroform, and less anæsthetic. Used hypodermically it is actively irritant, and produces extensive sloughing of the tissues.

The taste of Hydrated Chloral is hot and pungent; if used in large doses or in strong solutions it may excite gastritis, with nausea and vomiting. After a brief period of stimulation it depresses the heart and arterial tension, diminishes oxidation, and lowers the body temperature. On the brain it has a selective action; by inducing cerebral anæmia it produces a deep sopor, very like normal sleep, from which the patient may be awakened but immediately falls asleep again, and is not followed by headache or depression. In some persons instead of sleep it causes headache, insomnia and delirious excitement. It is not an anodyne, as it does not affect the conductivity of the sensory nerves, and does not interrupt the transmission of pain, but by overwhelming the centres prevents the consciousness of pain, and is, therefore, only indirectly an anæsthetic. A Large Dose produces profound narcotism, abolishment of the reflexes and of sensibility, and complete muscular relaxation, with a great fall of temperature. Death may result in the chloral

sleep, from paralysis of the cardiac motor ganglia and the respiratory centre, or by sudden failure of the heart in cases of fatty degeneration, or in old drunkards.

The Chloral Habit.—Chloralism is a state of marked anæmia, its subjects presenting a weak, irritable, often irregular heart, deranged liver function, jaundice, bileless stools, perhaps purpura and sloughing of a finger, from decreased blood-supply. Its votaries are on the border of insanity, excitable, uncontrollable in speech and action, talking in a silly manner and very volubly. Many cases of insanity result from the chloral habit. It diffuses rapidly into the blood, crenates the red corpuscles and in large quantities destroys the leucocytes. It increases the fluidity of the blood, producing an anæmic condition. It is excreted by the kidneys, partly unchanged, but chiefly as Uro-chloralic Acid, producing some diuresis; also by the skin, causing various eruptions if long used.

Antagonists.—*Heat* to the body is one of the most efficient. *Atropine* antagonizes its cardiac, respiratory and spinal depression, but accentuates the motor depression. *Morphine* given with chloral prevents the tendency to cardiac failure, while synergistic to its hypnotism. *Chloral* is the antagonist to *Strychnine*, opposing the spinal action of that drug, but the reverse is only true to a limited extent. Strychnine and caffeine may be given to strengthen respiration, though artificial respiration may be needed.

Therapeutics.—Hydrated Chloral is of great value as an hypnotic and antispasmodic, but must be cautiously used, if at all, in persons with weak or fatty hearts, atheromatous vessels, or advanced pulmonary disease. In combination with Potassium Bromide it is much used in asylum practice, and much abused; both drugs are cardiac poisons. It should never be given internally to relieve pain, but it is highly serviceable in:

Neuralgia, if triturated with Camphor and applied locally.

Sea-sickness, gr. v two or three times a day, generally very efficient.

Cholera in the algid stage, and in violent cases of cholera morbus.

Obstetrics, it is used to alleviate suffering, to relax the os uteri, to palliate puerperal convulsions, and to relieve after-pains.

Delirium Tremens, Hydrated Chloral is much used and is highly efficient.

It produces the best sleep in this condition, but is dangerous to old drunkards with damaged hearts.

Tetanus, the usual treatment is Hydrated Chloral and Potassium Bromide, in conjunction with anti-tetanic serum.

Cancers and Ulcers, a 25 per cent. solution locally, as an antiseptic and anodyne application.

Tic-douloureux, Croton-chloral is an efficient palliative, given in 5-grain doses every half hour, up to gr. xxx.

Epilepsy, for nocturnal attacks Hydrated Chloral in full dose, at bedtime.

Strychnine Poisoning, Hydrated Chloral is the antagonist *par excellence*.

Persistent Hiccough, Chloretone is of considerable value.

OPIUM—Opium

Nature and Source.—The concrete, milky exudation, obtained by incising the unripe capsules of *Papaver somniferum*, the white Poppy, an annual herb of the nat. ord. Papaveraceæ. In its normal, moist condition, it should yield not less than 9 per cent. of Morphine, when assayed by the official process. It contains 20 alkaloids, 2 neutral bodies, 2 organic acids, also wax, gum, sugar, resin, extractives, odorous principles, etc. The six principal alkaloids of Opium are:

Morphina, Morphine, $C_{17}H_{19}NO_3$, hypnotic, anodyne and narcotic.

Codeina, Codeine, $C_{18}H_{21}NO_3$, calmative, and less constipating.

**Thebaina*, Thebaine, not used medicinally.

**Narceina*, Narceine, probably has little or no action.

**Papaverina*, Papaverine, action doubtful, narcotic and convulsant (?).

**Narcotina*, Narcotine, wrongly named, having no narcotic action; is a tetanizer and highly antiperiodic.

These principles are combined in the plant with *Meconic* and *Lactic Acids*.

A Derivative of Morphine, obtained by the action of HCl acid, is: *Apomorphina*, Apomorphine, an artificial alkaloid and a powerful emetic; the *Hydrochloride* of which is official, and may be administered in doses of gr. $\frac{1}{40}$ – $\frac{1}{20}$ [av. gr. $\frac{1}{80}$] as an expectorant; as an emetic gr. $\frac{1}{15}$ – $\frac{1}{8}$ [av. gr. $\frac{1}{10}$].

Preparations of Opium.—The principal are:
Opii Pulvis, Powdered Opium. Dose, gr. ss–iij [av. gr. j].
Opium Granulatum, Granulated Opium. Dose, gr. ss–iij [av. gr. j].
Opium Deodoratum, Deodorized Opium, is Opium freed from the Narcotine and other principles which are soluble in petroleum benzin. Dose, gr. ss–iij [av. gr. j].

Extractum Opii, Extract of Opium, an aqueous extract, containing 20 per cent. of Morphine. Dose, gr. $\frac{1}{4}$ –ij [av. gr. ss].

Pilule Opii, Pills of Opium, each pill contains about gr. j of Pulvis Opii, incorporated with Soap. Dose, j–ijj [av. j].

Tinctura Opii, Tincture of Opium (Laudanum), Opium strength 10 per cent. Mx about equal gr. j of Opium, or gr. $\frac{1}{2}$ of Morphine. Dose, Mv–xxx [av. Mvii], according to the effect desired. The Tincture of Deodorized Opium (*Tinctura Opii Deodorati*), the Wine (*Vinum Opii*), and the Vinegar (*Acetum Opii*), have the same opium strength as the tincture (10 per cent.), and are given in the same doses.

Tinctura Opii Camphorata, Camphorated Tincture of Opium (Paregoric), has nearly gr. j of Opium in \mathfrak{z} ss, therefore only $\frac{1}{20}$ the strength of the tincture. Dose, for an infant, Mv–xx; for an adult, \mathfrak{z} j–iv [av. \mathfrak{z} j].

**Tinctura Opii Composita*, Compound Tincture of Opium, Squibb's Diarrhoea Mixture, has Tinct. Opii, Tinct. Capsici, Spt. Camphoræ, aa \mathfrak{z} j, Chloroformi Purif., \mathfrak{z} ij, Alcoholis, ad \mathfrak{z} v. Dose, for infants, gtt. j–x; for children, gtt. x–xxx; for adults, \mathfrak{z} j.

Pulvis Ipecacuanhæ et Opii (Dover's Powder), Ipecac 1, Opium 1, Sugar of Milk 8 parts, triturated to a fine powder. Dose, gr. v–xv [av. gr. viijss].

**Tinctura Ipecacuanhæ et Opii*, intended to represent Dover's Powder in liquid form; has of Tinct. Opii Deod. 100 evaporated to 80, Flex. of Ipecac 10, Diluted Alcohol to 100. Dose, Mv–xv [av. Mvii].

Salts and Preparations of Morphine, Codeine, etc.

Morphinæ Acetas, Morphine Acetate, soluble when fresh in 2.5 of water. Dose, gr. $\frac{1}{8}$ – $\frac{1}{2}$ [av. gr. $\frac{1}{4}$].

Morphinæ Hydrochloridum, Morphine Hydrochloride, soluble in 24 of water. Dose, gr. $\frac{1}{8}$ – $\frac{1}{2}$ [av. gr. $\frac{1}{4}$].

Morphinæ Sulphas, Morphine Sulphate, soluble in 21 of water, and in 0.75 of boiling water. Dose, gr. $\frac{1}{8}$ – $\frac{1}{2}$ [av. gr. $\frac{1}{4}$].

**Pulvis Morphinæ Compositus*, Compound Powder of Morphine (Tully's Powder), has of Morphine Sulphate 1.5, Camphor 32, Licorice 33, Calcium Carbonate 33.5 Dose, gr. v–xv [av. gr. viijss].

**Liquor Morphinæ Sulphatis*, Magendie's Solution, has gr. xvj of Morphine Sulphate in \mathfrak{z} j of Distilled Water, or gr. $\frac{1}{4}$ in Mviijss. Morphine in solution will change to Apomorphine if kept long.

**Liquor Morphinæ Sulphatis*, U. S. P., 1870, has gr. j of Morphine Sulphate to the \mathfrak{z} of Distilled Water. Dose, Mxxx– \mathfrak{z} ss.

Codeina, Codeine, soluble in 80 of water, in 17 of boiling water, and in 3 of alcohol. Dose, gr. $\frac{1}{4}$ –j [av. gr. ss].

Codeina Phosphas, Codeine Phosphate, soluble in $2\frac{1}{4}$ of water, and suitable for hypodermic use. Dose, gr. $\frac{1}{4}$ -j [av. gr. ss].

Codeina Sulphas, Codeine Sulphate, soluble in 30 of water, and in $6\frac{1}{4}$ of hot water. Dose, gr. $\frac{1}{4}$ -j [av. gr. ss].

**Syrupus Codeinae*, Syrup of Codeine, \mathfrak{z} j contains gr. $\frac{1}{4}$ of Codeine Phosphate. Dose, \mathfrak{z} j-iv.

**Narcotina Hydrochloridum*, Narcotine Hydrochloride. Dose, gr. ij-x, as an antiperiodic.

Cotarnina Hydrochloridum, Cotarnine Hydrochloride (Stypticin), the salt of a base produced by the oxidation of Narcotine. Dose, gr. j-v, by mouth or hypodermically, as a powerful hemostatic and sedative.

**Dionin* is the hydrochloride of the monoethyl-ester of morphine, soluble in 7 of water. Is the most innocuous of the morphine derivatives, and is used by ophthalmologists as a local analgesic in 4 to 7 per cent. solution. Dose, gr. $\frac{1}{6}$ -ss.

**Heroin* is diacetyl-morphine, insoluble in water, but soluble in dilute acids. It is one of the most toxic of the morphine derivatives, but is now official under its chemical name. Dose, gr. $\frac{1}{24}$ - $\frac{1}{6}$.

**Peronin* is benzyl-morphine, soluble in water, and almost free from the by-effects of morphine. Dose, gr. $\frac{1}{8}$ -j.

Minimum Fatal Dose of Opium.—In a child one day old \mathfrak{m} j of Laudanum was fatal; and in another aged 9 months a few drops of Paregoric caused death. In the adult gr. $\frac{1}{6}$ of Morphine, or gr. iv of Opium has proved fatal.

Tests for Morphine.—*Nitric Acid* produces an orange-red color, turning yellow, then disappearing. Test-solution of *Ferric Chloride* gives a blue color changing to green with excess of the reagent, and destroyed by free acids or alcohol, but not by alkalis. *Iodic Acid* liberates Iodine which may be tested by Starch. Vaughn has shown that certain intestinal ptomaines will give the same reactions with these reagents.

Physiological Action.—Opium is analgesic, hypnotic, diaphoretic, anti-spasmodic, narcotic, also a cardiac and respiratory depressant, after primary brief stimulation thereof. In medium dose (gr. j) it dries all the secretions, except those of the breasts and the skin, the latter being increased; produces dryness of the mouth and throat, arrest of the gastric secretion, retarded digestion and anorexia; does not affect the conductivity of the nerves. The action of the heart is increased, and the arterial tension raised; the pupils slightly contracted; the mind becomes calm; light

sleep follows, disturbed by dreams; and headache, constipation and some depression result.

In Full Dose (gr. iij), it arrests digestion; causes nausea and vomiting; greatly increases the sweat; depresses the heart and circulation, impairing oxidation and lowering temperature; contracts the pupils by stimulating the motor oculi; causes pruritis, especially of the nose; often retention of urine; and soon profound sopor (in some cases coma-vigil, delirium); leaving as after-effects nausea, depression, constipation, vertigo, anorexia, nasal pruritus, fetid pathological secretions.

A Toxic Dose produces cold, clammy sweat, very slow heart, abolished reflexes, coma; the pupil minutely contracted, but dilated as the end approaches; and death by suspension of respiration, due to the direct action of the poison on the respiratory centres in the medulla.

Post-mortem shows only a wet brain, congested lungs, and engorgement of the venous trunks, and the right side of the heart.

Morphine and Codeine.—As compared with the action of Opium, that of *Morphine* is more anodyne and hypnotic. It causes more intense pruritus, is less stimulant, less convulsant, less constipating and less diaphoretic. *Codeine* may be considered chemically a Methyl-morphine, and like all methyl compounds has an action similar to that of Curare, viz., motors paralyzant. It exalts the spinal cord more than Morphine, and affects the cerebrum less, producing muscular tremor and excess of sedation. It reduces the urinary sugar in diabetes, and has a selective sedative influence on the pneumogastric.

Treatment of Opium Poisoning.—The chief indications are to evacuate the stomach, maintain respiration, and keep up the circulation. *Potassium Permanganate*, in dose one-half greater, is antidotal to Morphine in the stomach. *Atropine* antagonizes its cerebral action, also its action on the pupil, heart and arterial tension (?), but if given too freely will endanger the case by substituting Belladonna narcosis for Opium narcosis; gr. $\frac{1}{20}$, hypodermically, every 15 minutes, for three doses, is generally sufficient. *Strychnine*, *Coffee*, *Caffeine*, and *Cocaine* are also physiologically antagonistic to Morphine. *Faradization* of the chest muscles, cold affusion and artificial respiration are of great value. *Flagellation* is a very dangerous procedure, from the exhaustion produced; strong faradic currents are much more efficient. *Evacuation of the stomach and bladder* is important, to prevent reabsorption.

Therapeutics.—The chief indications for the use of Opium are: (1) to relieve pain; (2) to produce sleep; (3) to allay irritation; (4) to check excessive secretions; (5) to support the system; (6) as a sudorific. It is badly borne usually by women and children, and in some persons great nausea and depression follow its use, which may usually be averted by the conjoined administration of Potassium Bromide, Hydrobromic Acid, or Spirit of Ether, with each dose of the opiate used. It is especially valuable in:

Pain from any cause except acute inflammation of the brain.

Low Fevers when insomnia and low muttering delirium, and to support the system when sufficient food cannot be taken or retained.

Irritation of the bronchi, bladder, stomach, as in acute severe vomiting.

Peritonitis, used freely, even to narcotism, it has often saved life.

Diarrhœa, Dysentery, Enteritis, etc., it is a very efficient remedy.

Acute Uræmia, Loomis urges its use to control convulsions in acute parenchymatous nephritis; it is dangerous in chronic renal disease, whether parenchymatous or interstitial (?).

Colds and Muscular Rheumatism, Dover's powder as a diaphoretic, conjoined with hot drinks and hot foot-baths.

Gastralgia, no remedy equal to Morphine and Bismuth Subnitrate.

Colic, rectal suppositories containing the Extract of Opium.

Spasm, Morphine hypodermically in muscular spasm, is efficient.

Cholera Morbus and Dysentery, gr. $\frac{1}{12}$ of Morphine with gr. $\frac{1}{20}$ of Atropine, promptly effective after ingesta are removed by an active cathartic.

Serous Inflammation, the Deodorized Tincture to slight narcotism.

Cerebro-spinal Meningitis, Opium is the remedy if given early, before exudation has set in.

Diabetes Mellitus, Codeine and Morphine *per os* reduce the sugar promptly, but have little or no effect when used hypodermically.

Dyspnœa from any cause is relieved by Morphine, especially that of cardiac disease.

Cardiac Disease, especially aortic stenosis or insufficiency, with dyspnœa, paroxysms, of angina pectoris, or signs of cerebral anæmia, Morphine hypodermically presents the greatest advantages.

Hemorrhages, especially uterine, due to fibroids or cancer, the influence of Opium on the circulation is invaluable, in allaying restlessness.

Contraindications for the use of Opium are alcoholism, disease of the respiratory organs, advanced disease of the kidneys, and some forms of cerebral congestion and cardiac disease, *childhood*.

HUMULUS—Hops

Source and Composition.—The strobiles (fruit-cones) of *Humulus Lupulus*, the hop vine, a cultivated climbing plant of the nat. ord. *Moraceæ*. The glandular powder of the strobiles is also official, under the name *Lupulinum* (Lupulin). *Humulus* and *Lupulin* contain a liquid, volatile alkaloid, *Lupuline*, also wax, resins, *Lupulinic acids* and a *Volatile Oil* which consists in part of *Trimethylamine* and *Valerol*, the latter being changed into *Valeric Acid* by long exposure, giving a disagreeable odor to old hops.

Preparations.

- **Fluidextractum Humuli*, Fluidextract of Hops. Dose, ℥v–xv [av. ℥vii].
- **Lupulinum*, Lupulin, is the glandular powder, separated from the strobiles. Dose, gr. v–xv [av. gr. vijss].
- **Oleoresina Lupulini*, Oleoresin of Lupulin, an acetone extract. Dose, gr. ij–v [av. gr. iiij].

Physiological Action.—*Humulus* is a bitter tonic, a feeble hypnotic, also diaphoretic, and astringent. It increases the cardiac action and the cutaneous circulation. After slight cerebral excitement it produces calm and a soporific disposition (?).

Therapeutics.—It is used as a tonic and calmative in:

Delirium Tremens of mild form, a mixture of the fluidextracts of *Lupulin* and *Capsicum* is an efficient substitute for Alcohol.

Dyspepsia, of atonic form, *Humulus* is a very serviceable remedy.

Inflammation, a Hop poultice is a favorite domestic application.

Nervous Irritability, the Fluidextract of *Lupulin* as a calmative and hypnotic; or the Hop pillow which exercises considerable influence.

It is probable that the assumed calmative influence of *Humulus* is more imaginary than real.

LACTUCARIUM—Lettuce

Source and Composition.—The concrete juice of *Lactuca virosa*, acrid lettuce (nat. ord. *Compositæ*). It contains *Lactocin*, probably the active principle; also *Lactucin*, and two other bitter principles; and *Lactucerin*, an inert, waxy substance, constituting nearly one-half of the drug.

Preparations.

Tinctura Lactucarii, Tincture of Lactucarium, 50 per cent. Dose, ℥i-℥ij [av. ℥xxx].

Syrupus Lactucarii, Syrup of Lactucarium, has 10 per cent. of the tincture. Dose, ℥j-℥j [av. ℥ij].

Physiological Action.—Lactucarium is feebly hypnotic, sedative and diuretic. It is supposed to act similarly to Opium, but much more feebly, and without depressing after-symptoms.

Therapeutics.—It is used as a substitute for Opium, and as a remedy for cough, but is probably of no value whatever. The syrup is best employed as a vehicle for more active agents of the same class.

**Piscidia Erythrina*, Jamaica Dogwood, has been introduced as a substitute for Opium, being anodyne, hypnotic and narcotic, sialogogue, diaphoretic and mydriatic. It lowers reflex action, and arterial tension after a brief rise, weakens the heart and causes death by asphyxia. It is a good hypnotic and anodyne. Dose, of the fluidextract, ℥ss-j cautiously. Its value is undetermined.

BROMINE, BROMIDES

Bromum, Bromine, is a liquid, non-metallic element, having the symbol Br, obtained from sea-water and from certain saline springs; a dark, brownish-red, very volatile liquid, of strong and disagreeable odor. Its solution colors cold starch-water yellow. [*Iodine* colors it blue.] Bromine is only used by inhalation and locally as an escharotic. *Acidum Hydrobromicum Dilutum*, an aqueous solution containing 10 per cent. of absolute Hydrobromic Acid. Introduced into medicine as a substitute for the bromides. Dose, ℥x-℥ij [av. ℥j], well diluted.

Bromides and Preparations.

Ammonii Bromidum, Ammonium Bromide, NH_4Br , prismatic crystals, soluble in $1\frac{1}{2}$ of water and in 30 of Alcohol. Dose, gr. ij-xxx [av. gr. xv].

Calcii Bromidum, Calcium Bromide, CaBr_2 , a white, granular, deliquescent salt, very soluble in water and in alcohol. Dose, gr. ij-xxx [av. gr. xv].

Lithii Bromidum, Lithium Bromide, LiBr , white, granular, deliquescent, very soluble in water and in alcohol. Dose, gr. ij-xxx [av. gr. xv].

Potassii Bromidum, Potassium Bromide, KBr , cubical crystals, soluble in 1.6 of water, and in 200 of alcohol. Dose, gr. ij-xxx [av. gr. xv].

Sodii Bromidum, Sodium Bromide, NaBr , colorless, monoclinic crystals, soluble in 1.2 of water, in 13 of alcohol. Dose, gr. ij-xxx [av. gr. xv].

Strontii Bromidum, Strontium Bromide, SrBr_2 , colorless crystals, deliquescent, soluble in water and in alcohol. Dose, gr. ij-xxx [av. gr. xv].

**Zinci Bromidum*, Zinc Bromide, ZnBr_2 , a white, granular, deliquescent powder, very soluble in water and in alcohol. Dose, gr. ss-ij [av. gr. ij].

Bromoformum, Bromoform, Tribromo-methane, CHBr_3 , a clear and colorless liquid, of pleasant odor and taste, readily soluble in alcohol and in glycerin. Dose, ℥j-v [av. ℥iij].

[*Arsenic Bromide* is described under ARSENUM, *Aurum Bromide* under AURUM, *Ethyl Bromide* under ÆTHER, and *Monobromated Camphor* under CAMPHORA.]

Physiological Action of Bromine.—It is an active and painful escharotic, a deodorant and an antiseptic, setting free ozone. Its vapor is *highly* irritant to the respiratory mucous membrane and the eyes, producing cough, hoarseness and dyspnoea. Internally, it is an active, corrosive poison, causing violent gastritis, depression and collapse.

Physiological Action of the Bromides.—They are preëminently depressants of the cerebral and spinal functions, also alterative, antispasmodic and hypnotic. The Potassium salt is especially a cardiac and muscular paralyzant. They have a saline taste, and are very diffusible, but slowly eliminated. They are decomposed in the blood, and re-formed at the points of elimination (fauces, bronchi, intestines, skin and kidneys), where they irritate the mucous membranes. Continued for some time, they produce severe gastric catarrh. They reduce the number of the respirations, and the heart's action and force; and though diminishing the calibre of the arterioles, they lower arterial tension. They lessen the activity of the brain cells, producing somnolence; diminish the sensibility of the peripheral nerves, causing anæsthesia of the skin and mucous membranes. They impair motility and the sexual function, cause great pallor and emaciation, lowered body-temperature, acne on the face and upper extremities, fetid breath, dysphagia, sluggish reflexes and defective coördination; and if long continued may even impair the mental faculties, producing hallucinations in some cases, in others melancholia with suicidal tendency; also incompetence of the sphincters and paralysis, beginning at the periphery and extending to the centres. The general result of their action is termed *Bromism*, and is heralded by the acne and lowered faucial sensibility. It is probably due to the sedative influence of these agents on the sympathetic

system, causing general anæmia of the brain, spinal cord, sexual organs, and skin.

Differences in Action between the principal Bromides.

Potassium Bromide is the most toxic and is the least hypnotic. It contains 66 per cent. of Bromine.

Sodium Bromide is the least toxic, but the most hypnotic, and acts most energetically on the circulation. It contains 78 per cent. of Bromine.

Ammonium Bromide resembles the Potassium salt in action, except that it exerts less influence and is somewhat more stimulating.

Lithium Bromide contains the most Bromine (92 per cent.) and resembles the Sodium salt in action. It has proved better than the others in some cases of epilepsy, and is considered the best hypnotic of the series, though most apt to cause digestive disturbances.

Calcium Bromide is an efficient hypnotic, but otherwise not very active.

Strontium Bromide is said to be less apt than the others to produce the acne and other results of bromism.

Zinc Bromide produces effects generally similar to those of the other bromides, but is violently irritant in large doses.

Antagonists and Incompatibles.—Vaso-motor stimulants, as *Digitalis*, *Ergot*, *Belladonna*, antagonize many of the effects of the Bromides, but *Morphine* is the most efficient antagonist, especially for the mental symptoms (?). Nitrous Ether is incompatible with *Ammonium Bromide*, and Acids and metallic salts are so with all the Bromides.

Therapeutics.—The Bromides are used as sedatives to the nervous system, to lower reflex activity, to produce sleep, to subdue excitement of the genital apparatus, and to antagonize congestion of the brain. Their use is terribly abused, by patients, nurses, and even by physicians, as Dr. Hammond well elucidates in his book on Nervous Diseases. They should not be used in anæmic conditions, and never for any length of time without the daily supervision of a physician. The combination of *Potassium Bromide* with *Hydrated Chloral* is very unsafe in cases where fatty or weak heart exists, both drugs being active cardiac depressants. In: *Convulsive and Spasmodic Affections*, the Bromides are very efficient. *Epilepsy*, especially *diurnal seizures*, *Sodium Bromide* in sufficient quantity to maintain anæsthesia of the fauces, for three or four years. Purgation occasionally, to prevent its accumulation in the system, and Arsenic to antagonize the acne. But it is never curative, and causes steady deterioration.

Diabetes Mellitus, the Ammonium and Arsenic Bromides in cases of nervous origin, have a sedative influence on the medulla oblongata.

Acute Rheumatism, Ammonium Bromide is an excellent alkali.

Muscular Rheumatism, the Lithium salt gives very good results.

Nervous Erethism, the Bromides are much used, and with good effect.

Insomnia with congestion, as from cerebral overwork, they are useful, but should be employed but seldom.

Infantile Colic, Sodium Bromide in 5-grain doses, with a little Oil of Anise, is considered by some, but should be avoided.

Vomiting of cerebral origin, they are extremely useful.

Bromides should not be given to children.

Whooping-cough, and other reflex coughs, the Bromides as palliatives, or Bromoform in daily doses of 5 to 20 minims, administered in glycerin or alcoholic solutions.

Oxana and tuberculous and other ulcers of the larynx, Bromoform locally, as a deodorizer, disinfectant and analgesic.

Seminal Losses, if plethora exists, are well treated by bromides, but even better by vigorous exercise.

Nymphomania, these agents have almost a unique though temporizing power.

Hydrobromic Acid may be used as an alternate substitute for the Bromides in almost all their affections, except epilepsy. In:

Neurasthenia and post-hemiplegic convulsions, it may supersede the Bromides, being efficient in these conditions.

Tinnitus Aurium and similar subjective noises, whether due to Quinine or Salicylates or not, are sometimes alleviated by this acid.

In Quinine Solutions, Mij to each grain, it aids the solubility, and neutralizes the effects of the alkaloid upon the ears.

Cerebral Disturbances of continued fevers, it does good service; also in subjective cerebral symptoms, as "swimming of the head," etc.

CEREBRAL EXCITANTS

This group includes agents which are classed in other systems as Antispasmodic, Deliriants, and Cardiac Stimulants.

CAMPHORA—Camphor

Camphor is a stearopten (solid volatile oil), obtained from *Cinnamomum Camphora* (nat. ord. Laurinæ), a tree indigenous in China,

Japan, Borneo, Formosa, etc. It is slightly soluble in water (1 to 1300), but freely so in Alcohol, Ether, Chloroform, and Oils. Dose, gr. j-ijj [av. gr. ij].

Derivatives.—*Camphor-cymol* is obtained by its distillation with Zinc Chloride; *Camphoric* and *Camphretic Acids* result respectively from its lesser or greater oxidation. An artificial Camphor is made by synthesis from Oil of Turpentine.

Preparations.

Aqua Camphoræ, Camphor Water, strength, 8 in 1000, with 8 of alcohol to aid in the suspension of the Camphor. Dose, ʒj-iv [av. ʒij].

Spiritus Camphoræ, 10 per cent. in alcohol. Dose ℥x-xx [av. ℥xv].

Linimentum Camphoræ, has 20 of Camphor to 80 of Cotton-seed Oil.

**Ceratum Camphoræ*, has of the Liniment 10 per cent.

Camphora Monobromata, Monobromated Camphor, almost insoluble in water. Dose, gr. j-v [av. gr. ij], in emulsion.

**Acidum Camphoricum*, Camphoric Acid, a dibasic acid, obtained by the action of nitric acid on camphor. Dose, gr. x-xx [av. gr. xv].

Camphor is an ingredient of *Linimentum Saponis* and *Tinctura Opii Camphorata*.

Physiological Action.—Camphor is antispasmodic, anodyne, antiseptic, diaphoretic, a stimulant expectorant, a cerebral irritant, a gastro-intestinal irritant, and a counterirritant. It has an acrid, hot taste; irritates the skin and mucous membranes, in quantity exciting severe gastric inflammation, with all the effects of an irritant poison. In medicinal doses it irritates the vaso-motor system, shows respiration slightly (centric) but has little effect on the heart. It causes disturbances of mental activity, even producing intoxication; promotes perspiration (?), allays pain, and increases the menstrual flow (?); its continued use depresses the generative function.

Large Doses depress the heart and lower arterial tension and diminish the reflex functions of the cord, producing flushing of the skin, insensibility, coma, convulsions and perhaps death. Elimination takes place by the bronchial mucous membrane (?), skin and *kidneys*. Camphor has often caused dysuria.

Monobromated Camphor resembles the bromides, but its action is not identical with theirs. In mammals it produces muscular weakness passing into paralysis, lowered temperature and respiration, stupor and death. In some cases its use by man has been followed by epilepti-

form convulsions. It is a nervous sedative and hypnotic, and a gastric irritant.

Therapeutics.—Camphor was much used by the older physicians, and is yet greatly valued in China and Japan. It has a reputation for very uncertain action. It is, however, much employed in:

Cholera and choleraic diarrhoea, allaying intestinal pain and cramp, checking intestinal secretion, and restoring warmth to the extremities.

Summer Diarrhoea, from nervous exhaustion and irritability, a few doses of the Spirit will often check this complaint promptly.

Vomiting and Gastralgia, Camphor has long been effectively employed.

Nervousness, nervous headache, restlessness, hypochondriasis, hysterical convulsions, etc., as a sedative and antispasmodic, but of doubtful value.

Nymphomania, Erotomania, etc., it is palliative.

Whooping-cough, cough from habit, and the sympathetic cough of mothers, the Monobromated Camphor in 5-grain doses; but since the effect here is due to the bromine action, it had best be discarded.

Fevers, small doses in milk frequently used are of value to promote sleep and quiet reflexes.

Dysmenorrhœa and After-pains are relieved by 10-grain doses.

Chordee and Strangury, are relieved by drachm doses of the Spirit (?).

Myalgia, Lumbago, etc., the Liniment is apparently palliative.

Catarrhal Colds are broken up by Camphor if used in the incipency internally and by olfaction. It may be used in conjunction with a Dover's Powder.

Night-sweats of Phthisis, Camphoric Acid in doses of gr. x-xxx dry on the tongue, 2 hours before the time for sweating.

Asthma, Dyspnœa, Whooping-cough, Camphor diminishes the excitability of the respiratory centre (?), and has been used with satisfaction.

ASAFETIDA—Asafetida

Source and Composition.—A gum-resin obtained by incision from the living root of *Ferrula fatida*, an Afghan plant of the nat. ord. Umbelliferae. Its principal constituent is a Sulphuretted Volatile Oil, which chiefly consists of *Allyl Sulphide*. It also contains a Gum and a Resin, with Ferulic, Malic, Acetic, Formic and Valeric Acids.

Preparations.

Tinctura Asafetida, strength 20 per cent. Dose, ℥x-xxx [av. ℥xv].

Emulsum Asafetida, Emulsion of Asafetida (Milk of Asafetida), strength 4 per cent. in water. Dose, ʒij-ʒj [av. ʒiv].

Pilula Asafetida, Pills of Asafetida, each pill has gr. iij of Asafetida with gr. j of Soap. Dose, j-iv [av. ij].

Physiological Action.—Asafetida formerly had the reputation of being a powerful anti-spasmodic, a nerve and cerebral stimulant, a stimulating expectorant; as well as tonic, laxative, diuretic, diaphoretic, emmenagogue, aphrodisiac and anthelmintic. It is much more probable, however, that the benefits assumed to have accrued from the administration were due to the mental impression produced by the odor and taste rather than to any actual medicinal virtue. To avoid taking a second dose most patients would have an exceedingly rapid amelioration of symptoms. Its taste and odor are very nauseous and persistent. In small doses continued it is said to cause impaired digestion, alliaceous eructations, acidity in the fauces, gastralgia, flatulent distention, fetid flatus, burning urination, diarrhoea and tenesmus. Full doses produce various phenomena of nervous or hysterical type.

It produces a subjective sensation of warmth without any rise of the body temperature, and stimulates the secretions and excretions. In Asia it is used as a condiment with food, and though extremely nauseous at first to most people, a taste for it may be acquired.

Therapeutics.—The disgust which most every one feels for this agent makes its use very restricted. It is a drug which might as well be entirely eliminated from the *Materia Medica*. It is incapable of producing any medicinal effect not better accomplished by less obnoxious agents, whereas its use makes both the physician and patient uncomfortable without advancing the welfare of either.

CANNABIS INDICA—Indian Hemp

Source and Composition.—The flowering tops of the female plant *Cannabis Sativa* (nat. ord. Moraceæ), grown in the East Indies. It contains a resin named *Cannabin*, and a volatile oil, from which are obtained *Cannabene*, a light hydrocarbon, and *Cannabene Hydride*, a crystalline body.

CANNABIS AMERICANA, which was official in the U. S. P. 1880, is the same plant, grown in the Southern States, and is specifically identical with the Indian plant, but of much less powerful action. Cannabis should not be confounded with the so-called "Indian or Canadian Hemp," which is *Apocynum Cannabinum*, an entirely different plant, having diuretic properties, but no others of marked character.

Preparations.

Extractum Cannabis, Extract of Indian Cannabis. Dose, gr. $\frac{1}{8}$ – $\frac{3}{4}$ [av. gr. $\frac{1}{6}$], if active.

Fluidextractum Cannabis, Fluidextract of Indian Cannabis. Dose, Mj–v [av. Mj], but much larger doses may be safely given. It is an alcoholic preparation and only miscible with aqueous fluids in form of emulsion, otherwise the active resin will separate and float to the top.

Tinctura Cannabis, Tincture of Indian Cannabis, 10 per cent. Dose, Mv–xxx [av. Mxij].

Preparations of Hemp commonly used in the East are:

Churrus, an impure resin, obtained by rubbing the leaves together.

Gunjah, the dried leaf as sold in the bazaars for smoking purposes.

Hashish, Siddhi or Bhang, an Arabian confection, containing the leaves mixed with aromatics and various fruits.

Physiological Action.—Cannabis Indica is antispasmodic, analgesic, anæsthetic and narcotic, and induces a mixture of depression and stimulation. It increases imaginative activity, stimulates the vaso-motor nerves, raising the arterial tension, and depresses sensation.

Large Doses cause a pleasurable intoxication, during which the traits peculiar to the individual are exalted; the ideas follow each other so rapidly as to produce a sense of great prolongation of time, minutes seeming as if hours or even days. With this occurs increased muscular activity, and sensations of double consciousness and enormous dimensions; the sight and hearing are exalted, the pupils dilated, anæsthesia sets in, the reflexes are lowered by stimulation of inhibition (Setschenow's centre?); and if the dose be a heavy one a cataleptic state is induced. Sleep or coma follows, according to the size of the dose, but death has rarely been caused by this drug.

After-effects are possible dullness, heaviness, vertigo, headache, and confused thought; but no nausea, no vital depression, or constipation. Repeated use of the drug produces mental weakness and impotence. It causes a ravenous appetite, and increases the energy of the uterine muscular fibre, but has no power to initiate uterine contractions.

Therapeutics.—Cannabis Indica was formerly much used as an anodyne and hypnotic, and as an anæsthetic during surgical operations. It is out of fashion now, but useful in:

Migraine, or sick-headache, in which it often prevents the recurrence of the attacks, seeming to act specifically on Ringer's migraine centre.

Neuralgia, full doses during the attack, smaller doses in the intervals. *Uterine Affections*, as chronic metritis, subinvolution, menorrhagia, dysmenorrhœa, etc., its powers as an anodyne and stimulant of the uterine muscular fibre render it an efficient agent.

Dysuria and retention of the urine are often relieved by it. In spasm of the bladder and other painful affections of that organ it may be found an efficient remedy, if administered in full doses.

Gonorrhœa, it lessens the discharge, inflammation, burning pain and restlessness, and allays chordee. The tincture of the American plant is very useful here, being fully as efficient as Copaiba or Sandal, and much more agreeable. It should be prepared from the fresh plant, and given in 3-5-drop doses 3 or 4 times a day, after the subsidence of the acute symptoms.

Insomnia, especially that of acute mania, though usually a combination of Opium and a Bromide will be found more satisfactory.

CAFFEINA—Caffeine

Caffeine (Theine) is officially described as a feebly basic substance, obtained from the dry leaves of *Thea Sinensis* (the tea-plant), or from the dry seeds of *Coffea Arabica* (the coffee tree), and also found in other plants. The principles, Caffeine and Theine, are therefore officially declared to be identical, but their identity with Guaranine is left unsettled. The Caffeine of commerce is usually obtained from old tea-leaves. It contains more nitrogen than almost any other proximate vegetable principle, and occurs in colorless, flexible crystals, which are soluble in 80 of water and in 33 of alcohol. Dose, gr. ss-ijj [av. gr. j].

The **Coffee-Plant**, *Coffea Arabica*, is a small tree of the nat. ord. Rubiaceæ, 15 to 30 feet high, native of South Arabia and Abyssinia, but cultivated in various parts of the world. Its seeds contain *Caffeine* 0.2 to 0.8 per cent. (partly free, partly as a tannate), tannic and caffeic acids, sugar, legumin, etc. By roasting them, part of the caffeic acid is converted into methylamin, the sugar is changed into caramel, and several volatile substances are formed, which give to coffee its peculiar aroma and some of its stimulant qualities, and are collectively known as *Caffeone*, one of them being called *Caffeol*.

The **Tea-Plant**, *Thea Sinensis*, is a native of China and Japan, and a member of the nat. ord. Ternstroemiaceæ. Besides *Theine* (Caffeine),

it contains another alkaloid *Theophylline*, also Tannic Acid and a volatile oil, the latter of which is most abundant in green teas. These principles are methyl derivatives of *Xanthine*, which occurs also as a waste product of metabolism in the muscles and other organs, and is eliminated in the urine.

Preparations and Analogues.

Caffeina, *Caffeine*. Dose, gr. ijss.

Caffeina Citrata, Citrated Caffeine, is a very uncertain mixture, and is not looked upon as a definite compound. Dose, gr. j-v [av. gr. ij].

Caffeina Citrata Effervescens. Dose, ʒss-jss [av. ʒj], in a glassful of water.

Caffeine Sodio-Benzoeas, a mixture of caffeine and sodium benzoate, containing about 47 per cent. of anhydrous caffeine. Dose, gr. v.

**Diuretin*, Sodio-theobromine Salicylate, should contain 46 per cent. of Theobromine, a principle in *Theobroma cacao*, closely allied to caffeine. Dose, gr. x-xv, several times a day, as a diuretic.

Guarana is a dried paste consisting chiefly of the seeds of *Paullinia Cupana*, nat. ord. Sapindaceæ, from Brazil. It contains Caffeine and Theobromine. Dose, gr. xv-xlv [av. gr. xxx].

Fluidextractum Guaranae, Fluidextract of Guarana. Dose, ℥xv-xlv [av. ℥xxx].

Physiological Action.—Caffeine is at first a stimulant, and subsequently a paralyzant, to the nerve-centres in the cerebrum, medulla and cord. In small doses it improves the action of the heart and raises arterial tension; stimulates the cerebral functions, by increasing the supply of blood to the brain; increases the respiration rate and the secretion of urine. Larger doses (gr. v-viiij) often over-stimulate the cerebral circulation, causing thereby great heaviness of the head, flashes of light before the eyes, tinnitus aurium, insomnia, restlessness, and even delirium, the pulse becoming rapid, feeble, irregular and intermittent, and the general body-temperature elevated, though that of the periphery may be lowered. Large doses depress the heart and respiration, and lower the blood-pressure; in the smaller animals exalting the reflex excitability of the cord and producing tetanic convulsions, and in lethal doses paralyzing the cardiac muscle as well as its motor ganglia, but causing death by paralysis of respiration. It powerfully affects muscular fibre, both voluntary and involuntary kinds, throwing it into a state of tetanic contraction resembling rigor mortis. If administered

in sufficient quantity it would doubtless prove fatal to man, but its lethal dose for him would be very large. Caffeine is excreted as xanthin compounds in the urine, and is a reliable hydragogue diuretic, acting by stimulation of the secreting apparatus in the kidney, as well as by generally raising the arterial tension.

Allied Plants are *Thea sinensis*, the tea-plant, which contains Caffeine and Theophylline; *Theobroma cacao*, containing Theobromine, a principle allied closely to caffeine; *Sterculia acuminata*, the Kola-plant, the nut of which contains Caffeine and small quantities of Theobromine; *Paullinia sorbilis*, the seeds of which (Guarana) contain Caffeine and Theobromine; *Ilex Paraguayensis* (Maté) contains a very small quantity of Caffeine; *Erythroxylon Coca*, contains the alkaloid Cocaine, which is allied to caffeine in action, but is more powerful.

The Common Stimulant Beverages Compared

The Qualities possessed in common by these substances, and for which they are so universally esteemed by mankind, are two-fold. They all (1) retard the retrograde metamorphosis of the body-tissues (tissue-waste), thereby enabling work to be done upon a smaller supply of reparative material (food), and with less fatigue. Furthermore, when used in moderation, they are all (2) more or less stimulating to the mental processes.

This similarity of action they owe to the possession of principles, which, if not identical, are so closely related to each other that until very recently they have been so considered both by chemists and pharmacologists. Their divergence from each other, in the finer shades of their action, depends most probably on the existence in each of differing aromatic and volatile principles, which modify the action of the alkaloid in some degree. Similar principles are developed in them by the various processes of preparation (as roasting, drying, etc.); all of which have some part in determining the general action of the beverage containing them.

Coffee, used with moderation, assists digestion, promotes intestinal peristalsis, allays fatigue and hunger, increases tissue-waste and consequently increases the formation and excretion of urea. Used to excess it disorders digestion, and causes functional disturbances of the nervous system, shown by headache, vertigo, mental confusion, and palpitation of the heart. It increases secretion, exalts reflex excitability, increases mental activity, and may produce insomnia and nervous restlessness. It first briefly stimulates the heart and raises arterial tension, but soon depresses both. The wakefulness is usually preceded by a brief period of drowsiness.

The brief stimulation of the intellect, consequent on drinking a cup of good coffee, cannot be obtained from an infusion of raw coffee, and is probably due to the volatile constituents developed in roasting. *Caffeone* opposes Caffeine in its action on the circulation, as it quickens the pulse and lowers arterial tension. Its action, however, is of brief duration, and soon gives way to the influence of the principal constituent. The Tannin is the ingredient which enables it to produce dyspepsia, and is most abundant in those infusions which are kept a long time on the stove before being served.

The green bean produces different effects from those of the roasted one, exhibiting the action of Caffeine alone, unmodified by that of the empyreumatic products. A tincture of green coffee, besides being an efficient diuretic, has marked anti-lithic powers, and promotes the elimination of the poison of gout from the system (?).

Tea is the most refreshing member of the group. Used to excess, it powerfully affects the stability of the motor and the vaso-motor nerves, the action of the heart, and the digestive function, producing flatulent dyspepsia, tremulousness of the limbs, pallor of the surface, irregular cardiac action and feeble impulse, hallucinations, nightmare, anorexia, headache, nausea and vomiting, obstinate neuralgia, especially of the supra-orbital and occipital nerves; also constipation, and a pain in the left side are not infrequent. The condition of chronic tea-poisoning is termed "Theism," and is often seen among women of the lower class in cities, who do not indulge in alcoholic beverages, but freely accept the dominion of the "cup that cheers."

Maté (*Ilex Paraguayensis*, Paraguay tea) is supposed to be intermediate in its effects between tea and coffee. It also contains Caffeine, in the proportion of 1.2 per cent.

Guarana (*Paullinia Cupana* of Brazil) contains an alkaloid, *Guaranine*, in the proportion of 5 per cent., which is identical with Caffeine. It is especially noted for relieving a nervous headache, for which purpose the official fluidextract may be used in doses of ℞xx, 3 or 4 times daily, when the basis of that preparation happens to be of good quality.

Coca, or *Cuca* (*Erythroxylon Coca*, see page 132), is more sustaining and less of a direct stimulant, than either tea or coffee. The proportion of Cocaine in the leaves varies greatly in different samples, as they occur in commerce.

Cocoa (*Theobroma Cacao*, the Chocolate-tree) is more directly nutritious than any of the group, containing a large quantity of fat, *Oleum Theobromatis* (cacao-butter), which makes it difficult of digestion to many persons. Its alkaloid, *Theobromine* is closely allied to Caffeine. The various preparations of this agent are made from the seeds, after the oil has been expressed from them. They are ground in a mill, mixed with rice, barley, sugar, flour, etc., and put up in powdered form, called *Cocoa*, but if flavored with vanilla and pressed into a cake, the product is *Chocolate*. The thin husks which envelop the seeds are known as "*Shells*," and are used to make a beverage similar to but milder than cocoa or chocolate.

Therapeutics.—Although without a very extensive range of usefulness, Caffeine is a valuable stimulant in many forms of nervous and cardiac depression, and has proved efficacious in:

Headaches of neuralgic or nervous type, or due to *cerebral anæmia*, the pain being general over the head, gr. j of Caffeine every half hour.

Choleraic Diarrhœa, and that of phthisis, it checks outward osmosis by stimulating the depressed nervous apparatus.

Dropsy, cardiac and renal, Caffeine as a diuretic and cardiac stimulant.

Cervico-brachial Neuralgia, Caffeine hypoder., gr. j, increased to gr. v.

Tachycardia accompanying depression is often corrected by gr. iij Caffeine.

Insomnia of chronic alcoholism, gr. $\frac{1}{2}$ of Caffeine hypodermically.

Acute Alcoholism, Caffeine antidotes the dangerous depression of the cerebral centres.

Asthma, if not used habitually Coffee is valuable in the paroxysm.

Opium Narcosis, Caffeine hypodermically, or better still, strong black coffee, to antagonize the increasing torpor of the nervous centres.

COCA—Coca

Source and Composition.—The leaves of *Erythroxylon Coca*, a small Peruvian shrub of the nat. ord. *Linææ*, also called *Cuca*. It contains an active, crystalline alkaloid, named *Cocaine*, which by heat and HCl Acid is resolved into Benzoic Acid and another alkaloid, *Ecgonine*. The leaves of the plant grown in Java furnish another alkaloid, *Tropacocaine*, also a benzoic acid compound. Dose of the leaves, gr. x — 3j [av. gr. xxx.]m.

Coca should not be confounded with *Cocoa*, a beverage prepared from the seeds of *Theobroma Cacao*, the Chocolate-tree, for which see *supra*.

Preparations, etc.

**Fluidextractum Coca*, Fluidextract of Coca, Dose, ℥x-℥j [av. ℥xxx].

**Vinum Coca*, Wine of Coca, has 6½ per cent. of the fluidextract. Dose, ℥j-℥j [av. ℥iv].

Cocainæ Hydrochloridum, Cocaine Hydrochloride, very soluble in water. Dose, gr. ⅛-j [av. gr. ¼]; hypodermically gr. ⅛-gr. ss; by spinal injection, gr. ¼.

**Oleum Cocainæ*, Oleate of Cocaine, has of the alkaloid itself 5 per cent. For local use.

**Tropacocaina*, Tropacocaine, obtained from Java leaves, but also made synthetically. It is less toxic than cocaine. Dose, gr. ⅛-j; by spinal injection for general anæsthesia gr. ¾.

**Eucaïne-B*—is an artificial alkaloid, used instead of Cocaine. Solutions of 1 to 2 per cent. of the hydrochloride are used in the eye, and stronger ones for spinal anæsthesia. Dose, gr. ⅛-j.

Novocaine is much less toxic than Cocaine and also less powerful as an anæsthetic. But it acts on the nerves only without involving other tissues, and its action may be prolonged by the addition of epinephrin.

Physiological Action.—In small doses Cocaine is a cerebral, cardiac, respiratory and nervous stimulant, and a diuretic. It improves digestion, stimulates respiration, increases the heart's action, raises the arterial tension, and exalts the irritability of the sensory nerves. It stimulates the brain by increasing its blood-supply, producing wakefulness and marked diminution of fatigue and hunger. This stimulation is succeeded, often accompanied, by marked descending depression. It increases the cutaneous circulation, flushing the surface, exciting perspiration and a sense of heat, and does actually raise the body-temperature, in cases of poisoning. It dilates the pupil, both when locally applied and when taken systemically, and stimulates intestinal peristalsis as well as the evacuation of the bladder in a few minutes after its ingestion.

An overdose produces symptoms of cardiac and respiratory embarrassment in a very short time. The pulse, at first quick and forcible, becomes small, rapid and intermitting; the heart apparently standing still in systole once in every 10 or 12 beats. Respiration is slow and shallow, and a sense of "tightness" about the chest is very marked; the skin grows cold and clammy, and the subject is seized with a sense of impending dissolution. Death occurs in animals by paralysis of respiration, but in man there seems to be a tetanoid spasm of the cardiac

muscle, which is equally dangerous to life. Other symptoms are impairment of coördination, hallucinations and delirium. *Local Doses* paralyze the intra-cardiac motor ganglia, the posterior columns of the cord and the sensory nerves, and the respiratory centre.

As a *Local Anæsthetic* the power of Cocaine is very great over a limited area. Applied to such structures as the Schneiderian membrane, mucous covering of the glans penis; or injected hypodermically in other locations, it blanches the structures and causes a profound but temporary anæsthesia throughout a small space. Applied to the tongue it temporarily destroys both taste and tactile sensibility; to the ocular conjunctiva, it produces profound anæsthesia of that membrane, together with dilatation of the pupil, partial paralysis of accommodation, enlargement of the palpebral fissure, slight lachrymation, and sometimes temporary ptosis. This profound degree of anæsthesia is thought by some to be due to its paralyzing the terminal twigs of the sensory nerves, by others to be due to vaso-motor action rendering the nerves bloodless and therefore unable to transmit sensory impressions. It produces mydriasis by stimulation of the ends of the sympathetic in the iris, and does not affect the third nerve or the sympathetic centre.

As a *General Anæsthetic* Cocaine is remarkably efficient when injected into the spinal canal. After the administration of gr. $\frac{1}{4}$ by this method complete anæsthesia usually follows in the lower extremities within 10 minutes, in the upper parts of the body within 20 or 30 minutes, and lasts from 1 to 4 hours, with no effect on consciousness. The after-effects in many cases include vertigo, headache, nausea and vomiting. This procedure is not free from danger, mental shock, circulatory disturbances, and profound collapse being frequently experienced, and death has occurred in several cases. Tropacocaine, in dose of about gr. $\frac{3}{4}$, is equally efficient and much less toxic, and is preferred for this purpose by many operators.

In its general action, Cocaine resembles Atropine very closely, especially in its influence upon the pulse and blood-pressure, the respiration, pupils, salivary glands, sweat-glands and intestinal peristalsis. In its symptoms, both from large and small doses, it almost parallels Sparteine, another cardio-inhibitory depressant. It is the most complete antagonist to the effects of Morphine, stimulating the respiration, heart, vaso-motor system, general metabolism, the muscular system, and the psychic functions, increasing arterial pressure and the body temperature, all

of which are profoundly depressed by morphine in the second and third stages of its toxic action.

Antagonists.—*Amyl Nitrite* combats the earliest symptoms of cardiac depression, then Artificial Respiration. The most direct antagonist is *Chloral*, so also are Chloroform and Ether. *Morphine* is also directly antagonistic at almost all points.

Therapeutics.—Coca-leaves are habitually chewed by the Peruvian Indians, to sustain them during arduous labor. Their example was imitated by Weston, the pedestrian, during his protracted walks. In South America, it is used by 8 millions of people, much as we use tea and coffee. It is useful in:

Migraine and Neuralgia, with depression, it is of real utility.

Vomiting of Pregnancy, and vomiting from any cause, it is efficient, even in the vomiting of yellow fever; 6-10-minim doses of a 4 per cent. solution every hour by the mouth.

Stomatitis, Gastralgia, for its benumbing effect on the mucous membrane.

Rhus Poisoning by either the oak or ivy is promptly relieved by the application of a 5 per cent. solution of oleate, freely over the affected surface. It gives instant relief from the burning and itching, and speedily reduces the dermatitis. (Observation by author.)

As a Mydriatic for ophthalmological use, Cocaine has peculiar qualities which make it one of the most serviceable of the class. The dilatation produced by it is great, is quickly attained, lasts only 12 to 20 hours, is promptly overcome by the application of Physostigmine, and is not accompanied by much photophobia.

As a Local and General Anæsthetic, Cocaine has been freely used, but practitioners of experience are becoming dissatisfied with it on account of its toxic action in many cases. For spinal injections to produce general anæsthesia, Tropicocaine and Eucaine are preferred, and Novocaine is much more satisfactory for local application.

SERPENTARIA—Snake-root

Source and Composition.—The root of *Aristolochia Serpentaria*, and *Aristolochia reticulata*, plants of the nat. ord. Aristolochiaceæ, indigenous to the United States. It contains a Volatile Oil, a Camphor-resin, and *Aristolochine*, a bitter principle, soluble in both alcohol and water.

Preparations.—They should be of the fresh root.

**Fluidextractum Serpentariae*, Fluidextract of Serpentaria. Dose, ℥x-xxx [av. ℥xv].

**Tinctura Serpentariae*, Tincture of Serpentaria, 20 per cent. Dose, ʒss-ij [av. ʒj].

Tinctura Cinchona Composita (see under Cinchona), contains 2 per cent. of Serpentaria. Dose, ʒss-ij [av. ʒj].

Physiological Action.—Serpentaria is a feeble stimulant tonic and expectorant, also a cardiac stimulant, as well as diaphoretic, diuretic, emmenagogue, and somewhat antiperiodic. Its taste is warm and pungent, its odor characteristic. Small doses promote appetite and digestion, increase the bronchial and intestinal secretions, the action of the heart, the cutaneous circulation, and the surface temperature; and produce considerable mental exhilaration. These observations are largely empirical.

Large Doses are irritant, causing nausea and vomiting, vertigo and headache, with colic, borborygmi, rectal tenesmus, flatulent distention, and frequent but not watery stools. The irritant action seems to produce gas rather than fluid. Itching of the anus and hemorrhoids are occasionally caused by its use.

Therapeutics.—Serpentaria is chiefly used as a *vehicle* for other stimulant drugs, but has been advocated as follows. In:

Bronchial Affections, it may have some value as a stimulant expectorant, and may be combined with other expectorants.

Bilious Vomiting, it checks the nausea and settles the stomach.

Probably Serpentaria has very little therapeutic value other than as simple bitters.

VALERIANA—Valerian

Source and Composition.—The root of *Valeriana officinalis*, a plant of the nat. ord. Valerianaceæ. It contains a Volatile Oil, from which are developed by oxidation *Valeric Acid*, *Valerene* and *Valerol*.

The *Valeric Acid* of Pharmacy is a product of the oxidation of Amylic Alcohol (fusel oil); it is not identical with the acid derived from the plant, though from it are prepared the Valerates.

Preparations.—The Oil is by far the best.

**Fluidextractum Valerianæ*, Fluidextract of Valerian. Dose, ℥x-xlv [av. ℥xxx].

Tinctura Valeriana, Tincture of Valerian, 20 per cent. Dose, ℥ss-℥j [av. ʒj].

Tinctura Valeriana Ammoniata, Ammoniated Tincture of Valerian, 20 per cent., in Aromatic Spirit of Ammonia. Dose, ℥v-xlv [av. ℥xxx].

**Oleum Valeriana*, Oil of Valerian. Dose, ℥j-v.

The Ammoniated Tincture and Fluidextract are extremely nauseous, and the latter is too bulky to be used. The taste is best covered by combination with Cinnamon. The various Valerates (of Zinc, Ammonium, Iron, and Quinine) are made with the acid produced from Amylic Alcohol, and do not represent the action of the plant, but rather that of the bases from which they are respectively prepared.

Physiological Action.—Valerian is generally classed as an antispasmodic, or a nerve tonic. It is somewhat sedative to reflex excitability, and diaphoretic, laxative and anthelmintic. Its taste and odor are horrible, except to cats, they being extravagantly fond of it. It greatly excites the sexual appetite in these animals, possibly from a resemblance of its odor to their own when under venereal excitement. After a time it produces in them violent spasms and convulsions.

In full doses it increases the action of the heart and raises the temperature, in most persons producing exhilaration, and in some slight mental disturbance, with formication of the hands and feet. It reduces motility and sensibility, and decreases reflex excitability, being antagonistic to the actions of Strychnine, Brucine, Thebaine, etc. Long used, it induces a condition of low melancholy and hysterical depression. Large doses cause hiccough, nausea, vomiting and diarrhoea, with tenesmus of the bladder, frequent micturition and lithates in the urine. These asserted actions are largely reports of empirical observations; laboratory investigations do not seem corroborative.

Therapeutics.—Valerian was formerly much used in *Epilepsy*, but it was probably only useful in the hysterical form (hystero-epilepsy). It is a remedy at one time advocated in:

Hysterical Disorders of all kinds.

Flatulence of the hysterical and in infants is quickly relieved by it.

Nervous Headache is often treated by Ammonium Valerate in 10-grain doses, administered in the form of an elixir. Valerian belongs in the same therapeutic class with Asafoetida; its chief virtue is its vile odor which quickly leads one to abandon it.

MOSCHUS—Musk

Musk is the dried secretion from the preputial follicles of *Moschus moschiferus* (the Musk Deer), an animal inhabiting the mountainous region of Central Asia. It occurs in irregular, unctuous grains, of a reddish-brown color, peculiar and penetrating odor and bitterish taste, contained in oval sacs about 2 inches in diameter, membranous on one side, hairy on the other. About 10 per cent. is soluble in alcohol, 50 per cent. in water. Chinese Musk in the pods or sacs is the most valuable, but all varieties are adulterated, the price of the drug being high. Dose, gr. ij–vj [av. gr. iv]; of the tincture, ℥xx–jss [av. 3j].

Physiological Action and Therapeutics.—Concerning Musk Cushny says: "Very little is known with certainty as to its composition, and the odoriferous matter which is believed to be the active principle has scarcely been examined. Hermans could find no effects from the administration of musk to men or animals. It is rarely used at the present time, and may be considered entirely superfluous."

SUMBUL—Sumbul

Sumbul is the dried rhizome and root of an undetermined plant, probably of the nat. ord. Umbelliferae, growing in northern Asia. It contains *Angelic* and *Valeric Acids*, also a volatile oil, balsamic resins, and a bitter principle. Dose, gr. x–3j [av. gr. xxx].

Preparations.—Two are official, viz.:

Fluidextractum Sumbul, Fluidextract of Sumbul. Dose, ℥x–3j [av. ℥xxx].

Extractum Sumbul, Extract of Sumbul. Dose, gr. j–x [av. gr. iv].

Physiological Action and Therapeutics.—Although Sumbul has been advocated for a varied number of conditions, especially of the hysterioid type, practically nothing is known as to its pharmacodynamics. It has an odor somewhat resembling musk and is frequently substituted for that drug as an adulterant. It may well be discarded.

MOTOR DEPRESSANTS

This group, besides the Motor Depressants proper (Conium, Gelsemium, etc.), includes some which are often classified as Cardiac Depres-

sants (Aconite, Veratrum, etc.), and others as Delirians (Belladonna and its congeners).

CONIUM—Hemlock

Source and Composition.—The full-grown fruit of *Conium maculatum*, the Spotted Hemlock (nat. ord. Umbelliferae), gathered while yet green. It contains a liquid, volatile alkaloid, *Coniine*, also *Methyl-coniine* in varying proportion, a solid alkaloid, *Conhydrine*, a volatile oil, and *Conitic Acid*. Coniine forms crystalline non-volatile salts.

Preparation and Derivative.

**Fluidextractum Conii*, Fluidextract of Conium. Dose, Mj-x [av. Mijj].

All Conium preparations are uncertain, the active principle being very volatile. Each sample should be tested before fixing on its dose, and should have the characteristic mouse-like odor.

**Coniina*, Coniine, $\text{C}_8\text{H}_{15}\text{N}$, the active alkaloid. Dose, $\text{M}\frac{1}{10}$ - ij , or gr. $\frac{1}{60}$ - $\frac{1}{10}$. If given hypodermically, it must be neutralized by acetic acid, as shown by the use of litmus paper, otherwise it is too irritant; or the *Hydrobromide* in solution, gr. viij ad ℥j , of this Mx = gr. $\frac{1}{6}$. This salt may be used in doses of gr. $\frac{1}{2}$ -gr. j, as it is not actively toxic.

Physiological Action.—Conium is a gastric irritant, producing nausea and vomiting. The main action of *Coniine* is that of a paralyzant to the motor nervous system, beginning at the peripheral end-organs and extending upward, involving the peripheral ganglia and the nerve trunks. *Methyl-coniine* acts similarly but reversely, affecting the centres first; especially those in the spinal cord, causing paralysis of reflex action. Conium also blunts the common sensibility. Its prominent symptoms are numbness and weakness of the legs, nausea and vomiting, diplopia, dilated pupils, vertigo, impaired utterance, slow and labored breathing, and death by paralysis of the muscles of respiration. The heart is not affected; and the mind is clear until CO_2 narcosis sets in, but is torpid and indifferent. Socrates was poisoned by the juice of Conium, which was the state poison of the Athenians.

As the action of Coniine and Methyl-coniine vary considerably, and as the relative quantity of each alkaloid in the plant also varies, the results obtained from different samples of Conium differ in marked degree, and are often contradictory of each other.

Antidotes and Antagonists.—The antidote is *Tannic Acid*, which is chemically incompatible. *Nux Vomica* and its alkaloids, also *Picrotoxin*

and other tetanizers, are antagonistic. Active exercise will antagonize the full development of its toxic action.

Therapeutics.—Conium has been used as a sedative and to correct excessive motility, but has passed into almost complete disuse. It was formerly used in:

Chorea, palliates by depressing the motor nervous system.

Acute Mania, to quiet motor excitement and prevent exhaustion, Coni-

ne, \mathfrak{M}_{ss-ij} , or hypodermically, $\mathfrak{M}_{\frac{1}{10}}$, increased until some physiological effects are produced. Morphine given conjointly acts well.

Pain and Spasm coexisting.

Cancer, Conium locally and internally, to relieve the pain.

Tetanus, for its sedative action, Conium has been much used, but is inefficient.

Blepharospasm is relieved by it, in 10-minim doses of the fluidextract.

Epilepsy, *Hysteria*, *Hystero-epilepsy*, and most convulsive disorders, it can be given without fear of inducing a drug habit, but is of doubtful value.

*CURARE—Woorara

Source and Composition.—Curare is a vegetable extract, obtained from various plants (*Strychnos toxifera*, *Paullinia curare*, etc.) of the nat. ord. Loganiaceæ, and used in S. America as an arrow poison. Its active principle is the alkaloid *Curarine*, which contains no oxygen. The drug contains no Strychnine, nor any tetanizing principle.

**Curare*. Dose, gr. $\frac{1}{20}$ – $\frac{1}{6}$ hypodermically.

**Curarina*, Curarine. Dose, gr. $\frac{1}{200}$ – $\frac{1}{100}$ hypoder., or gr. $\frac{1}{60}$ by the stomach.

**Caroval*, *Vao*, are names of native preparations.

Physiological Action.—Curare paralyzes the myo-neural junction of nerves, but does not at first act directly on the brain or spinal cord; though if life be prolonged by artificial respiration, the cord, sensory nerves, and even the muscular tissues become implicated. The limbs are paralyzed first, death occurring by paralysis of respiration. The heart, at first quickened, becomes depressed, the blood-pressure lowered, the eyelids droop, the eyeballs protrude, vision is disordered, intestinal peristalsis and sensibility to stimuli are greatly increased, an artificial glycosuria (curare-diabetes) is set up, and all the secretions are increased, especially the saliva.

The absorption of Curare by the stomach is very slow, but its elimi-

nation, which takes place by the kidneys, is more rapid and complete than that of any other alkaloid. The urine of a curarized animal will poison another, and that of the second animal will paralyze a third.

Actions of Curare, Coniine and Gelsemine.—Curare and Coniine paralyze the myo-neural junctions of striated muscle, Gelsemine and Methyl Coniine paralyze the motor centres.

Antagonists.—Artificial respiration, to maintain life until elimination occurs. Evacuation of the bladder repeatedly is an important measure. *Strychnine*, though from a member of the same family, is antagonistic as to the effects on the heart and respiration.

Therapeutics.—The danger from the use of Curare is too great to permit of its employment, even if it had a rational indication, which does not yet appear.

GELSEMIUM—Yellow Jasmine

Source and Composition.—The rhizome and rootlets of *Gelsemium sempervirens*, a climbing plant of the nat. ord. Loganiaceæ, indigenous in the Southern States. It contains the highly toxic alkaloid *Gelseminine*, also *Gelsemine*, which when pure has but slight activity. The latter, as it occurs in commerce, is a mixture of the alkaloids, and owes its action to its contained Gelseminine.

Preparations and Derivative.

Fluidextractum Gelsemii, Fluidextract of Gelsemium. Dose, ℥ss-ij [av. ℥j], cautiously increased.

Tinctura Gelsemii, Tincture of Gelsemium, strength 10 per cent. Dose, ℥v-xv [av. ℥viiij], cautiously increased.

**Gelsemina*, Gelsemine, with acids forms soluble salts. Dose. gr. $\frac{1}{60}$ – $\frac{1}{20}$.

Physiological Action.—Gelsemium is a motor and respiratory depressant, acting on the anterior cornua of the spinal cord and the respiratory centres. Later in its action it depresses sensation. In moderate doses it causes languor, slowing of the cardiac rate, feebleness of muscular action, impaired sensibility, drooping eyelids and dilated pupils, with some diaphoresis. A *Toxic Dose* (a teaspoonful of the fluidextract) produces vertigo, diplopia, sloped eyelids, dilated pupils (paralysis of 3d nerve), labored breathing, slow and feeble heart, dropped jaw, staggering gait, great muscular weakness and almost complete general anæsthesia, profuse sweats, loss of articulation, and death by

asphyxia (paralysis of centre of respiration). Consciousness is preserved until CO_2 narcosis sets in. Convulsions do not occur in man, but do in lower animals, the convulsive movements being backward. Motion is affected before sensibility in warm-blooded animals, sensibility before motion in frogs. It paralyzes the inhibitory cardiac fibres.

Gelsemium, though it lowers the heart rate, is not an arterial depressant, and does not irritate the gastro-intestinal tract. The effects of a moderate dose pass off in about three hours. It produces a decided lowering of the body temperature.

Antagonists.—*Morphine* is the most complete antagonist, but *Digitalis*, *Ammonia* and *Alcohol* are also antagonistic. Emetics, heat to the body, artificial respiration and faradism of the muscles of respiration are measures of prime importance in poisoning by this drug.

Therapeutics.—Gelsemium is employed in conditions of exalted nerve function, and contraindicated when there is weak heart. It is used in: *Cough* of convulsive or spasmodic character.

Neuralgia of the 5th Nerve has been successfully treated by Gelsemium. *Remittent Fever*, it usually exercises beneficial influence.

After-pains are frequently suspended by moderate doses of the tincture. *Dysmenorrhœa*, Gelsemium often alleviates the pain.

Irritable Bladder of women, and incontinence of urine from spasm of the vesical muscular fibres, this remedy is often efficient.

Gelsemium resembles *Coniine* very closely in its action. It is a powerful medicine with not well-defined therapeutic indications. Physicians using it should be prepared to justify their choice.

ACONITUM—Aconite

Source and Composition.—Aconite is the dried tuberous root of *Aconitum Napellus*, the Monk's-hood or Wolf-bane, a perennial plant of the nat. ord. Ranunculaceæ, found in mountainous regions, and characterized by its deep-blue, helmet-shaped flowers. It contains the alkaloids *Aconitine*, $\text{C}_{34}\text{H}_{47}\text{NO}_{11}$, *Bensaconine* and *Aconine*, also Aconitic Acid. Dose, gr. $\frac{1}{4}$ –ij [av. gr. j].

Other Aconites are: *Aconitum Ferox*, from India, yielding the alkaloid *Pseudoaconitine*, which is even more toxic than Aconitine; *Aconitum Japonicum*, from Japan and China, containing *Japaconitine*, which is identical with Aconitine; *Aconitum Lycocotum*, the alkaloid of which is called *Lycocotinine*. The plant *Delphinium*

Staphisagria contains an alkaloid named *Delphinine*, which acts similarly to Aconitine, but less powerfully.

Preparations and Derivative.

Fluidextractum Aconiti, Fluidextract of Aconite. Dose, ℥ss-j [av. ℥ss].

A dangerous preparation.

Tinctura Aconiti, Tincture of Aconite, strength 10 per cent. Dose, ℥j-xv [av. ℥v]. Tinctures of Aconite-root vary greatly in strength, from that of the Brit. Phar., 5 per cent., to the French, 20 per cent. The best rule for the use of the drug is to give minim-doses of the 10 per cent. tincture every 15 minutes until the desired effect is produced.

Aconitina, Aconitine, is difficult to obtain of constant strength, some samples being all but inert, others extremely active. The "Aconitine Cristallisée" of Duquesnel (a Nitrate of Aconitine, *Squibb*), is considered the most active of the samples in the market. Dose, gr. $\frac{1}{600}$ – $\frac{1}{200}$ [av. gr. $\frac{1}{400}$]; but it is very dangerous and should be handled with great caution.

**Oleatum Aconitinae*, Oleate of Aconitine, 2 per cent., for external use.

**St. Jacob's Oil* is a weak Aconite Liniment which also contains Ether, Alcohol, Turpentine, red coloring matter, and water (*Squibb*).

Physiological Action.—The taste of Aconite is bitter, and acrid. Soon after the ingestion of even a small quantity, a sensation of numbness and a persistent tingling are felt in the tongue and lips. Full medicinal doses cause a sense of constriction in the fauces, irritation of the gastrointestinal mucous membrane, with increased secretion; sometimes nausea and vomiting, and severe pains in the joints and muscles; always more or less salivation, diaphoresis and diuresis, reduced respiratory power, decreased cardiac rate and force, lowered arterial tension and temperature. A *Toxic Dose* produces great muscular weakness, dimness of sight, dilated (sometimes contracted) pupils, shallow, irregular and labored respiration, a slow and weak pulse, coldness of the surface, clammy sweat, great anxiety, numbness and tingling in the extremities; lowering of the body temperature (2° to 3°), abolishment of sensation, reflexes and motility; and finally death from paralysis of the heart and respiration, with or without convulsions, consciousness being preserved until near the end, when CO_2 narcosis sets in.

Aconite is a powerful sensory, cardiac, respiratory, and spinal depressant, also diaphoretic, and antipyretic. It chiefly affects the peripheral ends of the sensory nerves, though there is also a direct effect on some of

the lower centres of the medulla. It stimulates the inhibitory centre of the heart, and poisons the cardiac muscle and its contained ganglia, and the respiratory centres, but does not affect the brain. Aconite is rapidly diffused and slowly excreted; the effects of a full medicinal dose continuing for 3 or 4 hours. Applied externally it paralyzes the sensory nerves of the part, producing characteristic numbness and tingling.

Antagonists.—Caffeine, Atropine, Morphine, Ether, Ammonia and Amyl Nitrite antagonize its effects on the heart and respiration. Atropine counteracts its heart action. In aconite poisoning, the stomach should be evacuated, warmth applied to the extremities, stimulants administered, artificial respiration if necessary, and the recumbent posture strictly maintained.

Therapeutics.—Aconite rightly used is one of the valuable drugs. It has been called the "therapeutic lancet," and certainly is responsible to a great extent for the disuse into which venesection has fallen. Its power over the circulation, respiration and transpiration renders it of great value in all affections characterized by high resisting pulse, dry, hot skin, and elevated body-temperature. It is especially useful in: *Acute Throat Affections*, as tonsillitis, pharyngitis, etc., drop-doses of the tincture every hour are remarkably efficient in these conditions.

Acute Inflammations of the Respiratory Organs, as bronchitis, coryza, pneumonia, etc., Aconite is efficient in the *early* stage, when there is present a *sthenic* febrile action, with high temperature.

Acute Pleuritis and Peritonitis, previous to the stage of effusion, Aconite combined with Opium is considered good treatment.

Surgical Fever is promptly met by Aconite, which is especially useful in preventing chill after the passage of the urethral sound or catheter.

Acute Rheumatism has been extensively treated with Aconite. It lessens the duration of the fever, mitigates the pain and swelling of the joints, and may prevent the occurrence of organic heart disease, if used from the commencement.

Cardiac Affections characterized by over-action or hypertrophy, without valvular lesions, are benefited by Aconite in small doses repeated.

Diarrhœa and Dysentery, from cold or exposure, Aconite is unquestionably beneficial. It also relieves *Constipation* in patients of plethoric habit, with dry, hot skin, and a feverish tendency.

Menstrual Suppression from chill, Aconite often relieves promptly.

Neuralgia, especially of the face or brow, Aconite is very efficient. It

may be applied locally over the seat of pain; for this purpose a reliable *Aconitine* should be used, mixed with Chloroform and Oleic Acid.

Aconite is a powerful drug and must be used with great caution, especially with young people and frail adults. It is much less used than formerly.

*PULSATILLA—Pasque-flower

Source and Composition.—Pulsatilla is the herb, collected soon after flowering, of *Anemone Pulsatilla* and *Anemone pratensis*, small, herbal plants of the nat. ord. Ranunculaceæ, to which Aconite also belongs. They inhabit Europe and Siberia, have large, purple flowers, and though inodorous are very acrid, containing an acrid, yellow oil, which in the presence of water is gradually changed into *Anemonin*, which is a volatile camphoraceous principle, and *Anemonic Acid*, which seems to be inert.

Preparations.—A tincture may be made according to the pharmacopœial directions for Tinctures of Fresh Herbs, which may be used in doses of ℥℥₀—x.

**Anemoninum*, Anemonin. Dose, gr. ʒ₀—ij or more, in pill.

Physiological Action.—Pulsatilla is said to be a paralyzer of motion and sensation, a gastro-intestinal and cutaneous irritant, a cardiac, respiratory, and spinal depressant. It dilates the pupil, produces diaphoresis and diuresis, and is believed to possess emmenagogue power. Locally applied it produced numbness and tingling in the part, and may even excite violent inflammation. Its action is due to *Anemonin*, and strongly resembles that of Aconite. The statements published concerning the assumed physiological action of Pulsatilla are very contradictory. Apparently no scientific determination of its properties has been attempted.

Therapeutics.—Pulsatilla has been recommended for uterine affections, Orchitis, Dyspepsia, Rhinitis, Coughs, Eczemas, and Meningitis, but it probably has no therapeutic action of any value in any of these cases. Certainly, the present empirical testimony is worthless.

VERATRUM

Source and Composition.—Veratrum is the dried rhizome and roots of *Veratrum viride*, American Hellebore, or *Veratrum album*. White Hellebore, plants of the nat. ord. Liliaceæ, the latter growing in the mountains of Europe. They contain the alkaloids *Jervine*, *Pseudojervine*,

vine, and *Rubijervine*; but *Veratrum viride* contains also *Veratrine* (*Cevadine*), and *Veratrum album* contains also *Protoveratrine*, *Protoveratridine* and other alkaloids. Dose, gr. j-ij [av. gr. ij].

Asagroea officinalis, *Veratrum Sabadilla*, *Cevadilla*, the source of the official Veratrine, a mixture of alkaloids, is a bulbous plant of the nat. ord. Liliaceæ, indigenous to Mexico and Central America. It contains the alkaloids *Veratrine* (*Cevadine*), *Cevadilline*, *Sabadine*, *Sabadinine*, and another base known as *Wright's Veratrine*.

Preparations and Derivative.

Fluidextractum Veratri Viridis, Fluidextract of *Veratrum*. Dose, ℥j-iv [av. ℥jss].

Tinctura Veratri Viridis, Tincture of *Veratrum*, strength 10 per cent.

Dose, ℥v-xv [av. ℥vii].

Veratrum Viride, "The dried rhizome and roots of *Veratrum viride*. Av. dose, gr. j.

Veratrina, Veratrine, a mixture of alkaloids, prepared from the seeds of *Asagroea officinalis*. Dose, gr. $\frac{1}{60}$ - $\frac{1}{10}$ [av. gr. $\frac{1}{80}$].

**Oleatum Veratrinæ*, strength, 2 per cent. in Oleic Acid and Olive Oil.

**Unguentum Veratrinæ*, strength, 4 per cent. For local use.

Physiological Action.—The action of *Veratrum* is closely allied to that of *Aconite*, being a powerful cardiac irritant and spinal paralyzant. It differs from *Aconite* in affecting the respiration to a much less degree, in being a systemic emeto-cathartic, in irritating the motor system centrally, impairing the reflexes, but leaving sensation unaffected, and in having little or no diuretic action. It causes great depression, but is seldom fatal; when death does result from its use it usually occurs by paralysis of respiration. In small doses it reduces the force of the pulse, and lowers its rate and output. If continued for some time, the pulse becomes very slow, soft and compressible; rising, on the least exertion, to be very rapid and feeble. At the same time there is great muscular weakness and frequently nausea and vomiting. Large doses increase these symptoms very much, the pulse becoming very rapid and so small as to be almost imperceptible; the skin is cold and clammy; and constant vomiting, extreme debility, giddiness, impaired vision, and partial unconsciousness ensue.

Jervine represents in part the depressant action on the circulation and on the central nervous system. It does not, however, affect the vagus, and but very slightly the voluntary muscles or the motor nerves. It

irritates the motor centres in the brain, causing convulsions, and lowers the functions of the cord, of the centres in the medulla, especially the vaso-motor, and those of the cardiac ganglia, slowing the heart by direct depression either of the cardiac muscle or its motor apparatus. It always causes salivation, but never vomiting or purging; and kills by asphyxia, the heart beating after respiration has ceased.

Rubijervine (also called *Veratroidine*) is a gastro-intestinal irritant, causes emeto-catharsis, and produces less violent convulsions. It stimulates the vagus centre and paralyzes the vagus ends, depresses the cord, and paralyzes the respiratory centre, but at the same time increases the excitability of the vaso-motor centre. The result is great slowing of the pulse-rate and of respiration, and lowering of blood-pressure, until the carbonated blood irritates the vaso-motor centre, when the blood-pressure rises greatly.

Veratrine is an acrid, intensely irritant powder, consisting of a mixture of alkaloids. It causes violent sneezing, a burning sensation, and free salivation. It affects the heart and circulation similarly to the other *Veratriæ*, and in addition seems to be a direct poison to muscular tissue, and to cause violent convulsions before the muscular paralysis sets in.

Treatment in Veratrum Poisoning is similar to that for Aconite. *Atropine* antagonizes the cardiac depression, as will also Ammonia, etc. The recumbent position should be maintained, and dry heat applied to the general surface.

Therapeutics.—*Veratrum* is inferior to Aconite though used in the same class of cases; but "neither its pharmacological action nor therapeutic experience supplies any indications for its internal use." It might well be discarded from the Pharmacopœia.

Externally some good results have been obtained in:

Superficial Neuralgia, the Oleate or Unguentum *Veratrinæ* externally. *Myalgia* and *Headaches* may often be relieved by the same application.

BELLADONNA—Deadly Nightshade

Source and Composition.—The leaves and root of *Atropa Belladonna*, a European plant of the order Solanaceæ. It contains the official alkaloid *Atropine*, $C_{17}H_{23}NO_3$; also the alkaloids, *Belladonnine*, *Hyoscyine*, *Hyoscyamine* and *Atropamine*, in varying quantity; also a coloring prin-

ciple named *Atrosin*, albumin, gums, etc. The official titles are as follows:

Belladonna Folia, Belladonna Leaves. Dose, gr. ss-jss [av. gr. j].

Belladonna Radix, Belladonna Root. Dose, gr. ss-jss [av. gr. $\frac{3}{4}$].

Allied Plants are *Hyoscyamus*, *Scopola*, *Stramonium*, *Duboisia*, and *Mandragora*, containing alkaloids which are closely allied to Atropine, both chemically and physiologically.

Preparations of Belladonna.

Extractum Belladonna Foliorum, Extract of Belladonna Leaves. Dose, gr. $\frac{1}{10}$ – $\frac{1}{2}$ [av. gr. $\frac{1}{6}$], cautiously increased.

Tinctura Belladonna Foliorum, Tincture of Belladonna Leaves, 10 per cent. Dose, Mj–xv [av. Mx].

Fluidextractum Belladonna Radicis, Fluidextract of Belladonna Root. Dose, Mss–ij [av. Mj], cautiously increased.

Emplastrum Belladonna, Belladonna Plaster, has of the extract 30 per cent. mixed with Adhesive Plaster.

Linimentum Belladonna, Belladonna Liniment, has of Camphor 5, dissolved in the fluidextract to 100.

Unguentum Belladonna, Belladonna Ointment, has of the extract 10 per cent., in Benzoinated Lard, Hydrous Wool-fat, and Diluted Alcohol.

The extract is a constituent of the Compound Laxative Pills, also of the Pills of Podophyllum, Belladonna and Capsicum.

Atropine Salts and Derivatives, etc.

Atropina Sulphas, Atropine Sulphate, soluble in 0.4 of water. Dose, gr. $\frac{1}{200}$ – $\frac{1}{100}$ [av. gr. $\frac{1}{160}$].

Oleatum Atropina, Oleate of Atropine, is a 2 per cent. solution of the alkaloid itself in Oleic Acid, Olive Oil, and Alcohol.

Homatropina Hydrobromidum, Homatropine Hydrobromide, is a salt of an alkaloid obtained by the condensation of *Tropine* (a derivative of Atropine) and Mandelic Acid. It is soluble in 6 of water, and is used as a mydriatic, its effects passing off more quickly than those of atropine. Dose, gr. $\frac{1}{150}$ – $\frac{1}{100}$ [av. gr. $\frac{1}{128}$].

Physiological Action.—Belladonna is an irritant narcotic, also mydriatic, anti-spasmodic, and anodyne; in small doses a cardiac, respiratory and spinal stimulant, in large doses a paralyzer of the secretory and motor nerve endings, and a stimulator of the entire sympathetic system. It produces dryness of the mucous membranes of the throat, mouth, nose and larynx; and lessens the gastric and intestinal secretions. It depresses all unstriated muscle, through paralysis at the myo-neural junction.

The Heart-rate [is at first slowed, but] soon becomes very rapid and vigorous, the arterial tension being at the same time raised, the circulation is greatly increased. This the drug accomplishes by paralyzing the intra-cardiac inhibitory ganglia, thus indirectly stimulating the accelerator apparatus while lessening inhibition. [Digitalis increases both.] The vaso-motor ganglia are paralyzed by toxic doses, the heart weakens, the vessels relax, and the blood-pressure is greatly lowered. Complete motor paralysis follows, then delirium, stupor, and finally death, usually by asphyxia.

The Pupils are dilated by the local or systemic use of the drug, by stimulation of the end-organs of the sympathetic, and paralysis of those of the motor oculi, thus increasing the power of the radiating iris fibres, and lessening the action of the circular fibres. Atropine also paralyzes accommodation, and increases intra-ocular pressure, if the tendency thereto is hypernormal. The least quantity of Atropine affecting the pupil is stated by Donders as the $\frac{1}{400,000}$ of a grain.

The Brain is congested by Belladonna, active delirium being induced and hallucinations with mental disorder, due to a selective action on the cells of the gray matter. *The Spinal Cord* medulla, and motor side of the brain, are stimulated in downward progression; followed in toxic doses by paralysis, central and peripheral; power being lost in the lower extremities first. Sensation is slightly impaired, but the muscular irritability is not. Respiration is increased, and the temperature raised. By the increased circulation metabolism is greatly promoted.

A Diffused Eruption of a scarlet color, greatly resembling that of scarlet fever, is often produced by Belladonna on the skin and fauces, with dysphagia and sore throat, and is sometimes followed by desquamation. It is due to capillary congestion caused by acute irritation of the vasodilator centre.

Diffused rapidly, Belladonna is also quickly eliminated, particularly by the kidneys. The urine of an animal under the action of Atropine will dilate the pupil of another animal. Herbivorous animals and birds are scarcely susceptible to the action of Belladonna, and pigeons are said not to be affected by it at all.

Antidotes and Antagonists.—In poisoning *Tannic Acid* and emetics should be used. *Opium* is the physiological antagonist for its effects on the cerebrum, pupil, heart, arterial tension, and kidneys; "but its action on the respiratory centre renders its use dangerous." Ether is

best to control spasms; caffeine for its effect on heart and brain; artificial respiration *in extremis*.

Therapeutics.—Belladonna is especially useful in:

Pain of inflammation, particularly that of gout, rheumatism, neuralgia due to peripheral disturbance, sciatica, cancer, and pelvic affections.

Cerebral and Spinal Hyperæmia, congestive headaches, encephalitis, meningitis and myelitis, it proves one of the very best remedies.

Inflammation of the lungs, iris, bladder, kidneys and breasts, are all amenable to Belladonna applied locally, or Atropine used hypodermically.

Constipation due to atony of the bowels, it is remarkably efficient; the tincture combined with Nux Vomica and Physostigma tinctures, equal parts of each, of which combination give 15-drop doses at night.

Enuresis of children, large doses (gtt. x-xx of tincture) thrice daily.

Cystitis, recent, from chill, the tincture internally, and the extract applied to the perinæum, are very efficient treatment.

Spasm of the urethra, bladder, anal sphincter, etc., is overcome by it.

Ulcers of the rectum, anal fissures, etc., are soothed and healed by the use of the extract locally, or the ointment.

Ptyalism from Mercury, pregnancy, etc., is arrested by Atropine.

Abscesses, boils, carbuncles, and other superficial inflammations, are remarkably benefited by Belladonna used locally.

Typhus and Typhoid in their early stages, Belladonna is very useful (?).

Acute Nasal Catarrh, with profuse watery discharge, it is very efficient.

Sore Throat, with fever, inflammation, redness, and swollen tonsils.

Scarlet Fever, Belladonna relieves many of the symptoms of this disease, and is well used when the rash is imperfect, the pulse feeble, and the condition adynamic.

Skin Diseases, notably erythema, herpes zoster and prurigo.

Sweats of Phthisis, gr. $\frac{1}{60}$ of Atropine is generally effective.

Asthma and Pertussis are well treated by Belladonna in full doses.

Cardiac Failure when sudden, Atropine as a cardiac stimulant.

Spermatorrhœa and seminal losses are treated by this remedy.

Poisoning by Opium, Physostigma and Hydrocyanic Acid. In Opium poisoning the unsuccessful cases treated by Atropine may be due to overdosing. The antidote should be given in small doses.

Ophthalmologists use Atropine to paralyze accommodation, dilate the pupil, contract the vessels, and lessen pain.

HYOSCYAMUS and SCOPOLA

Hyoscyamus is the dried leaves and tops of *Hyoscyamus niger*, Henbane, nat. ord. Solanaceæ. It contains the alkaloids *Hyoscyamine*, *Hyoscine*, and *Atropine*, the latter in very small quantity. Dose, gr. j-vj [av. gr. iv].

Scopola is the dried rhizome of *Scopola Carniolica*, nat. ord. Solanaceæ, containing the alkaloid *Scopolamine*, which is chemically identical with Hyoscine. Dose, gr. ss-j [av. gr. $\frac{3}{4}$].

Preparations and Derivatives of Hyoscyamus.

Extractum Hyoscyami, Extract of Hyoscyamus, prepared by evaporating the fluidextract. Dose, gr. ss-jss [av. gr. j].

Fluidextractum Hyoscyami, Fluidextract of Hyoscyamus. Dose, ℥j-v [av. ℥iij].

Tinctura Hyoscyami, Tincture of Hyoscyamus, 10 per cent. Dose, ℥v-xxx [av. ℥xv].

**Hyoscina Hydrobromidum*, Hyoscine Hydrobromide, soluble in 2 of water. Dose, gr. $\frac{1}{200}$ - $\frac{1}{100}$ [av. gr. $\frac{1}{128}$], but much larger doses are used for the insane. (See Scopolamine Hydrobromide.)

Hyoscyamina Hydrobromidum, Hyoscyamine Hydrobromide, very soluble in water. Dose, gr. $\frac{1}{200}$ - $\frac{1}{100}$ [av. gr. $\frac{1}{128}$].

**Hyoscyamina Sulphas*, Hyoscyamine Sulphate, very soluble in water. Dose, gr. $\frac{1}{200}$ - $\frac{1}{100}$ [av. gr. $\frac{1}{128}$].

Preparations and Derivatives of Scopola.

Extractum Scopolæ, Extract of Scopola. Dose, gr. $\frac{1}{8}$ - $\frac{1}{2}$ [av. gr. $\frac{1}{8}$].

Fluidextractum Scopolæ. Dose, ℥ss-ij [av. ℥j].

Scopolamina Hydrobromidum, Scopolamine Hydrobromide. Dose, gr. $\frac{1}{200}$ - $\frac{1}{100}$ [av. gr. $\frac{1}{128}$]. Nearly all the Hyoscine Hydrobromide furnished by manufacturers consists of this salt, they being chemically identical. The U. S. P. cites them as synonymous terms.

Physiological Action.—Hyoscyamus and Scopola have similar action to that of Belladonna, Duboisia and Stramonium, except that they are the least powerful and irritant of the group, but the most calmative and hypnotic. The delirium produced by them is never furious and is without hyperæmia, but is frequently accompanied by insomnia. They are more stimulant to the vaso-motor system and to the cardiac accelerator apparatus than Stramonium, but are less active on the pneumogastric. They have decided laxative and carminative effects on the intestines and a very marked sedative influence on the urinary passages.

Hyoscyamine is considered identical with Atropine in its effects on the motor apparatus and the circulation, including the heart and the vaso-motor system, but having a less stimulant action on the central nervous system, producing symptoms of cerebral depression instead of garrulous delirium. It is less powerful than atropine as a mydriatic, and in a few cases it has seemed to diminish the respiratory rate. Its occasional narcotic effect is due to admixture with hyoscine.

Hyoscine is a cerebral and spinal sedative, and a powerful hypnotic, directly depressing the higher functions of the brain, and affecting the heart but feebly. In large doses it is a dangerous depressant of the respiration, but it may be used without unpleasant effects in medicinal doses. Whenever full doses are employed the respiration and heart should be watched for several hours. The action of Scopolamine corresponds with that of Hyoscine.

Therapeutics.—Hyoscyamus is principally used as a hypnotic and anodyne *when Opium is contraindicated*. In:

Acute Mania with high motor excitement, obstinate insomnia and varied hallucinations, it is considered the best agent to use.

Chronic Mania has been benefited by it.

Insanity marked by frequent delusions, it is efficient at times.

Delirium Tremens, and the delirium of fevers, it is an excellent hypnotic, but needs to be used in larger doses than are generally employed.

Monomania of hypochondriacs is alleviated.

Neuralgias have been much benefited by Hyoscine hypodermically.

Nervous Coughs, Whooping-cough, especially a dry, tickling night cough, are greatly alleviated by Hyoscyamus.

Locomotor Ataxia, Hyoscyamine for the pains and incoördination.

Paralysis Agitans, mercurial tremor, etc., Hyoscine palliates the trembling.

Colic of various forms, Hyoscyamus has long been used.

Constipation, Purgatives are rendered more efficient and less drastic by combination with the Extract of Hyoscyamus.

General Anæsthesia, produced by the hypodermic injection of Scopolamine and Morphine, has been used by surgeons, but is often ineffective and may occasionally be highly dangerous.

STRAMONIUM

Source and Composition.—The leaves of *Datura Stramonium*, the Jamestown weed or Thorn apple, nat. ord. Solanaceæ. It contains the

alkaloids *Atropine* and *Hyoscyamine*, also some *Hyoscine*. The mixed alkaloids are named *Daturine*. Dose, gr. ss-ij [av. gr. j].

* *Datura Tatula* is an indigenous plant of the nat. ord. Solanaceæ, resembling *Stramonium* very closely, with which it generally agrees in its alkaloids, physiological action and therapeutics. It is distinguished by its purple stem, purple flowers and anthers, and the darker green of its leaves. It has been smoked in asthma, in a few cases giving continued relief when *Stramonium* had failed to render any service.

* *Mandragora*, the plant *Mandragora autumnalis*, contains *Mandragorine*, which is probably a mixture of *Atropine* and *Hyoscyamine*.

Preparations and Derivative.

Extractum Stramonii, Extract of *Stramonium*. Dose, gr. ss-ij [av. gr. ¼].

* *Fluidextractum Stramonii*, Fluidext. of *Stramonium*. Dose, ℥ss-ij [av. ℥j].

Tinctura Stramonii, Tinct. of Stram., 10 per cent. Dose, ℥v-xv [av. ℥vii].

Unguentum Stramonii, *Stramonium Oint.*, has 10 per cent. of the extract.

* *Daturina*, *Daturine*, the mixed alkaloids. Dose, gr. ½00-½0.

Physiological Action is similar to that of *Belladonna* in almost every particular. *Daturine* poisoning cannot be distinguished from that by *Atropine* and its effects are indistinguishable. It contains the same alkaloids as *Belladonna* and in the same percentage as the leaves.

Therapeutics.—*Stramonium* is chiefly used as an antispasmodic to relieve pain. The following indications, Asthma excepted, are as well met by *Atropine* with some *Hyoscine*. In:

Dysmenorrhæa and *Neuralgia*, combined with *Opium* and *Hyoscyamus*.
Spasmodic Affections, as asthma, laryngeal cough, hepatic colic, etc.

Asthma, the leaves are smoked to advantage at the commencement of a paroxysm, the smoke being drawn into the lungs.

Mania of furious character, especially the puerperal form, with suicidal tendency, *Stramonium* is highly serviceable, in 10-20-℥ doses of the tincture every 3 or 4 hours, until relief is obtained.

Nymphomania, with great mental depression, it is very useful.

Chorea and *Stammering*, *Stramonium* is a good remedy.

Ulcers of irritable character, the Ointment is much used as an anodyne.

Tic Douloureux and *Sciatica*, it is often efficient.

*DUBOISIA

Source and Composition.—The leaves of *Duboisia myoporoides*, an Australian tree of the order Solanaceæ. It contains an alkaloid, *Duboisine*,

which is apparently *identical* with Hyoscyamine; also Hyoscine, Pseudo-hyoscyamine and other alkaloids.

Preparations.

**Extractum Duboisia*, Extract of Duboisia. Dose, gr. $\frac{1}{10}$ – $\frac{1}{4}$.

**Tinctura Duboisia*, Tincture of Duboisia. Dose, \mathfrak{M} v–xx.

**Duboisina Hydrochloridum*, Duboisine Hydrochloride. Dose, gr. $\frac{1}{150}$ – $\frac{1}{60}$, the latter dose being frequently given with gr. $\frac{1}{4}$ of Morphine Sulphate.

Physiological Action is in every respect similar to that of its congener, Belladonna, except that the alkaloid Duboisine is more soluble in water than Atropine, is less irritating to mucous membranes, and more prompt in mydriatic action, but its effects are of shorter duration. It is also less of a cerebral excitant, and more of a calmative and hypnotic. Ringer says that on man its action is more powerful than that of Atropine, but less powerful on frogs.

Therapeutics.—Duboisine has been used by ophthalmologists as a mild substitute for Atropine, though it may be used instead of the latter in many conditions, especially the night-sweats of phthisis, respiratory neuroses, and cardiac failure. It is, however, entirely superfluous in the *Materia Medica*.

PHYSOSTIGMA—Calabar Bean

Source and Composition.—The seeds of *Physostigma venenosum* (nat. ord. Leguminosæ), a woody creeper of Calabar, West Africa, where it is used by the natives as an ordeal for witches, etc. It contains the alkaloids *Physostigmine* (*Eserine*), $C_{11}H_{21}N_3O_2$; *Calabarine*, a tetanizer like strychnine; and *Eseridine*. Dose of Physostigma, gr. j–iij [av. gr. jss].

Preparations and Derivatives.

Extractum Physostigmatis, Extract of Physostigma. Dose, gr. $\frac{1}{16}$ – $\frac{1}{4}$ [av. gr. $\frac{1}{8}$], but gr. j–iv are used in tetanus.

Tinctura Physostigmatis, Tincture of Physostigma, strength 10 per cent. Dose, \mathfrak{M} v–xx [av. \mathfrak{M} xv].

Physostigminæ Salicylas, Physostigmine Salicylate, bitter crystals, soluble in 75 of water and in 16 of alcohol. Dose, gr. $\frac{1}{100}$ – $\frac{1}{50}$ [av. gr. $\frac{1}{64}$].

Physostigma, Physostigma, the dried ripe seeds of *Physostigma venenosum*.

Average dose, gr. jss.

**Lamellæ Physostigminæ*, Disks of Physostigmine (B. P.), medicated disks, used locally on the eye, each containing gr. $\frac{1}{1000}$ of the sulphate.

Physiological Action.—Physostigma is a muscular irritant and a direct spinal depressant, producing general paralysis, and abolishment of the reflexes, but does not affect the brain. It stimulates secretion, excites nausea and vomiting; and is laxative by stimulating the muscular coat of the intestines, as well as by increasing the intestinal secretions. It stimulates the nerve terminals of unstriated muscle and glandular structures. It first raises, then lowers the arterial tension; and slows the heart by direct poisonous effect and by increasing the irritability of the vagus terminations. It produces dyspnoea by a tetanic action on the respiratory muscles, causing CO₂ poisoning, and death by paralysis of the centre of respiration. It contracts the pupils by stimulation of ganglia of 3d n. It is eliminated chiefly by the kidneys, the urine of the animal affected poisoning another.

Antagonists.—*Atropine* as to the respiration, heart and pupil, but it must be administered in full dose.

Therapeutics.—Physostigma has but a small field of action. In: *Atony of Intestine*, with tympanitis and meteorism, combined with *Belladonna* and *Nux Vomica*, it is sometimes very effective. *Tetanus*, it has been used with advantage to diminish reflex excitability; grain doses of the extract repeated every 2 hours.

Progressive Paralysis of the insane this drug seems to retard.

Strychnine and Atropine Poisoning, Physostigma is antagonistic.

Eye Diseases, Physostigmine (*Eserine*) is used by ophthalmologists to break up or prevent adhesions of the iris, to relieve tension, to prevent suppuration after operations, as well as to contract the pupil and the vessels of the eye, thereby relieving pain and photophobia.

ARNICA

Source and Composition.—Arnica is the dried flower-heads of *Arnica montana*, the Leopard's Bane, a perennial of the nat. ord. Compositæ, growing in mountainous districts throughout the northern hemisphere. It contains the alkaloids *Arnicine* and *Cytisine*; also *Trimethylamine*, an ammoniacal alkaloidal principle; *Inulin* and an essential oil, resins, etc. Dose, gr. v-xx [av. gr. xv].

**Trimethylamine*, Trimethylamine (CH₃)₃N, is an ammonia compound of the group styled *amines*, in which the three atoms of hydrogen are replaced by some organic radicle, in this case by Methyl (CH₃),

dissolved in water. It is a clear, colorless fluid, containing 10 to 20 per cent. of the absolute ammonia compound, has a disagreeable, fishy odor and taste, is strongly alkaline, and is miscible in all proportions with water. It is found also in Cod-liver Oil, in Humulus and Ergot, and may be obtained from codeine, fish-brine, human urine, herring-pickle, beet-sugar residue, and other decomposing albuminous substances. It behaves like an alkaloid and has strongly basic qualities. The Hydrochloride is the most stable salt, the dose being gr. j-iiij in solution every 2 or 3 hours, as an antipyretic.

Preparations.

Tinctura Arnica, Tincture of Arnica, strength 20 per cent. Dose, ℥v-xxx [av. ℥xv].

**Infusum Arnica*, Infusion of Arnica, 20 parts of the flowers to 100 of water, is thought by some to be the best preparation for local use, as it never excites dermatitis, probably by reason of its being devoid of the Essential Oil and the insoluble principle *Arnicine*.

Physiological Action.—Arnica is irritant, stimulant, antipyretic, diuretic, and vulnerary. It irritates the gastro-intestinal tract, and in alcoholic solution excites erysipelatous inflammation of the skin in some persons. In small doses it increases the action of the heart, raises the arterial tension, and stimulates the action of the skin and kidneys. Large doses produce a transient excitement, followed by depressed circulation, respiration and temperature; violent headache, dilated pupils, and muscular paresis. These asserted actions do not seem to have adequate laboratory corroboration.

Trimethylamine is an active escharotic, and a gastro-intestinal irritant; lowers the rate and force of the heart, decreases the body-temperature, and diminishes (sometimes increases) the excretion of urea.

Therapeutics.—Arnica has been advocated for a number of complaints, "but we have very little positive knowledge concerning its action in the system, and there is no sufficient reason for believing it is valuable in the treatment of internal diseases" (U. S. D., 196).

Sprains, Bruises, etc., the dilute tincture locally has a popular reputation. An infusion is better for local use, as the tincture may excite dermatitis.

Cuts, Wounds, etc., the aqueous preparations locally used promote the rapid union of cut surfaces.

Hemorrhages, Epistaxis, it is undoubtedly effective.

Chronic Dysentery with slimy and bloody stools, tormina and cutting pains, the tincture internally is often a very efficient remedy (?).

LOBELIA—Indian Tobacco

Source and Composition.—The leaves and tops of *Lobelia inflata*, a North American weed, of the nat. ord. Campanulacæ. It contains a liquid alkaloid *Lobeline*, also *Lobelic Acid*, *Lobelacrin*, resin, wax, etc.

Preparations and Derivatives.

Fluidextractum Lobelia, Fluidextract of Lobelia. Dose, ℥j–xv [av. ℥ viij], cautiously.

Tinctura Lobelia, Tincture of Lobelia strength 10 per cent. Dose, as expectorant, ℥v–xx [av. ℥vix]; as emetic, ℥ss–ij [av. ℥j].

**Lobelinum*, Lobelin, an impure resinoid. Dose, gr. ss–j.

Physiological Action.—Lobelia has an acrid, nauseous taste, and a very unpleasant odor. It is "expectorant," purgative, emetic, anti-spasmodic and narcotic. It excites an abundant flow of saliva, much gastric mucus, and profuse urination and reflex sweating; with nausea, vomiting, and great depression. The action of the heart is enfeebled; the blood-pressure, at first increased, soon falls; muscular debility, reduced temperature ensue, then coma and death by paralysis of the respiratory centre. The motor nervous system is chiefly affected, especially the medulla oblongata and the nucleus of the pneumogastric contained therein.

Antagonists.—*Strychnine*, Picrotoxin and Thebaine antagonize its action on the nervous system; the vaso-motor excitants, Digitalis, Belladonna, oppose its effects on the circulation.

Therapeutics.—Lobelia has gone out of fashion, yet it is used in: *Asthma*, a teaspoonful of the tincture every 15 minutes until nausea ensues, gives relief in the paroxysm.

Cough of dry, harsh character, with tickling in the throat and spasmodic dyspnoea, Lobelia is effective.

Impaction of the Cæcum, before inflammation occurs, two-drop doses of the tincture every hour is said to relieve the obstruction.

Poison-oak Eczema, an infusion (℥j to the pint) locally, is efficient. As an Emetic, Lobelia is entirely too depressant to be given to children.

Lobelia, if used at all, must be regarded as a dangerous drug, uncertain in relief but sure as to toxicity.

GRINDELIA

Source and Composition.—The leaves and flowering tops, of *Grindelia robusta* and *Grindelia squarrosa*, herbaceous Californian plants of the nat. ord. Compositæ. Its composition has not yet been definitely ascertained; but it probably contains an alkaloid, a resin, and a volatile oil.

Preparations.—Only one is official:

Fluidextractum Grindeliæ, Fluidextract of *Grindelia*, is extremely nauseous and contains much resin. Dose, ℥x-ʒj [av. ℥xxx].

Physiological Action.—*Grindelia* is not actively toxic, large doses being required to kill small animals. Taken in quantity it excites nausea and vomiting, depresses the heart, respiration and temperature, dilates the pupils, and causes sleep with lowered cutaneous sensibility and reduced reflexes. Finally, it produces motor paralysis, beginning in the legs, and causes death by paralysis of the muscles of respiration. It is slowly eliminated by the kidneys and the lungs, imparting to the urine and breath a peculiar violaceous odor. It should be stated, however, there is very little reliable data concerning *Grindelia*.

Therapeutics.—*Grindelia* has been used in spasmodic affections of the respiratory organs. In:

Spasmodic Asthma, as a palliative; 3-grain doses of an extract to avert the attack, or ℥xx-xxx of the fluidextract every half hour, beginning at the very onset. The dried leaves may be smoked in cigarettes, or the plant may be steeped in a saturated solution of potassium nitrate, dried and ignited, the patient inhaling the fumes.

Hay Fever is amenable to *Grindelia* in many instances; the fluidextract 4 parts, with 1 part each of the fluidextracts of Rhubarb and Senna, of which ʒij every half hour during the paroxysm, and afterward at intervals of 3 hours.

Whooping-cough, Coughs of Imitation and Habit, and those of spasmodic character are helped by *Grindelia*.

Spasmodic Dyspnœa, accompanying various pulmonary and cardiac diseases, *Grindelia* is often a very efficient remedy.

Rhus Poisoning, the fluidextract of *Grindelia* is said to be one of the most efficient local applications in poisoning by *Rhus toxicodendron*. The therapeutic suggestions for *Grindelia* are empirical, and have small experimental justification.

PHYTOLACCA—Poke-root

Source and Composition.—The root of *Phytolacca decandra*, nat. ord. Phytolaccaceæ, a North American plant. It contains a neutral principle. *Phytolaccin*; also *Phytolaccic Acid*, tannin, starch, a fixed oil, etc.

Preparations.—None are now official.

**Fluidextractum Phytolaccae*, Fluidextract of Phytolacca. Dose, as an alterative ℥j-iv [av. ℥jss]; as an emetic ℥x-xxx [av. ℥xv].

Physiological Action.—Phytolacca depresses the heart-rate and the respiration, and is a paralyzer of motion by central action on the spinal cord. It is a slow and depressant emeto-cathartic, also somewhat narcotic and alterative. It irritates the throat and tonsils; produces tetanic convulsions in animals, and death by paralysis of respiration. Several cases of poisoning by this plant have occurred. Its action is antagonized by Ether, Opium, Digitalis.

Therapeutics.—Phytolacca has been suggested in:

Mastitis, to arrest the inflammation and prevent suppuration, an extract may be applied locally and the fluidextract given internally.

Varicose Ulcers, and other ulcers of the leg, it promotes healing.

Eczema of obstinate character, has been cured by Phytolacca extract applied locally; also *Tinea Capitis*, and other skin affections.

However, Phytolacca "is seldom prescribed, and appears to be superfluous, at any rate until its action has been ascertained with more certainty."

HYDROCYANIC ACID

Hydrocyanic Acid, Prussic Acid, HCN, is a colorless, unstable inflammable liquid, soluble in water and in alcohol, very volatile, and so toxic that death has resulted from smelling it. It is never found outside the chemical laboratory, and is official only in the dilute form.

Preparations and Derivatives.

Acidum Hydrocyanicum Dilutum, Diluted Hydrocyanic (Prussic) Acid, has 2 per cent. of absolute HCN and 98 of water. Dose, ℥j-ijj [av. ℥jss], of a recent preparation. Forty minims have caused death. It is a constituent of the secret nostrum *Chlorodyne*, also of its various imitations, including B. P. preparation *Tinctura Chloroformi et Morphinae Composita*.

**Scheele's Dilute Hydrocyanic Acid*, is a 4 or 5 per cent. solution, and is highly dangerous, even by inhalation.

Oleum Amygdala Amara, Oil of Bitter Almond, contains a varying quantity of Hydrocyanic Acid, due to the reaction between the principle Amygdalin and the ferment Emulsin. Dose, $\mathfrak{M}\frac{1}{4}$ -j, in mixture [av. \mathfrak{Mss}].

**Potassii Cyanidum*, Potassium Cyanide, KCN, is soluble in 2 of water, sparingly soluble in alcohol. Dose, gr. $\frac{1}{20}$ - $\frac{1}{2}$ [av. gr. $\frac{1}{6}$]. Locally, a solution of gr. j-v to the \mathfrak{z} is as strong as should be used.

Physiological Action.—Hydrocyanic Acid is a very powerful poison, gr. ss having caused death. Its inhalation produces rapid insensibility and almost immediate exhaustion, death probably occurring from sudden paralysis of the central nervous system; respiration ceasing earlier than heart action. Some volitional movements may be made before death, unless the dose be very large. Its paralyzant action is expended on the brain centres, the peripheral afferent nerves, then on the spinal cord, the motor nerves and the muscular tissue, the muscles being fixed in tetanic rigidity after death. The blood is found, on post-mortem examination to be dark and fluid, and the venous trunks and cerebral sinuses gorged therewith. The odor of the Acid is fragrant, resembling that of bitter almonds or peaches. The effects of a medicinal dose pass off in an hour, at most.

Potassium Cyanide has similar action, and, in addition, possesses some peculiar to itself. Locally it causes inflammation of the skin, with an eczematous eruption and if applied in quantity to an abraded surface will produce fatal effects. In the stomach it is gradually converted into hydrocyanic acid by the aid of the gastric juice. It has proved fatal in doses of gr. iij-v, but its action is less rapid than that of the acid.

Antidotes and Antagonists.—*Atropine* has antagonistic action to Hydrocyanic Acid, but is too slowly diffused to be of much value. *Ammonia* by inhalation, by the stomach, with cold affusion to the spine and artificial respiration, are the measures most likely to avail in cases of poisoning, where there is time to do anything. In poisoning by Potassium Cyanide, the antidote is *Ferrous Sulphate* producing Prussian Blue (Ferrocyanide of Iron). Then evacuation of the stomach, artificial respiration and application of warmth.

Therapeutics.—Diluted Hydrocyanic Acid has been recommended for Coughs, Gastralgia, Mania and Melancholia, Worms, Skin Diseases,

and Headaches, but for any of these conditions we have drugs of greater efficiency, which are at the same time devoid of the toxic qualities which make Hydrocyanic Acid a very dangerous drug to use. Moreover, we have no reliable evidence that Hydrocyanic Acid is therapeutically efficient in any of the conditions for which it has at various times been recommended.

NITRITES

Amylis Nitris, *Amyl Nitrite*, is a liquid containing about 80 per cent. of Amyl Nitrite, $C_5H_{11}NO_2$, and occurs as a clear, yellowish, oily liquid, of powerful and ethereal odor, extremely volatile, insoluble in water, but soluble in alcohol, ether, etc. It is produced by the action of Nitric Acid upon Amylic Alcohol. Dose internally $M\frac{1}{4}$ -j, dissolved in alcohol; by inhalation, $Mij-v$ [av. Mij], but larger doses are probably safe, if not given too concentrated.

Glycerylis Nitras, *Glyceryl Trinitrate*, $C_3H_5(NO_3)_3$, is produced by the action of nitric and sulphuric acids upon glycerin, and is the dangerous explosive known by the name "Nitroglycerin." Official in the following preparation:

Spiritus Glycerylis Nitratis, Spirit of Glyceryl Trinitrate, Spirit of Nitro-glycerin (Spirit of Glonoin), is a 1 per cent. solution in alcohol.

Dose $Mss-ij$ [av. Mj].

**Tabellæ Trinitrini*, Tablets of Trinitrin, Tablets of Nitroglycerin (B. P.), each tablet contains gr. $\frac{1}{100}$ of the trinitro-glycerin of commerce. Dose $j-ij$.

Sodii Nitris, Sodium Nitrite, $NaNO_2$, deliquescent in the air, gradually oxidizing to sodium nitrate. Dose, gr. $ss-ij$ [av. gr. j], according to individual susceptibility.

**Tetranitrin*, Erythrol Tetranitrate, insoluble in water, soluble in alcohol, explodes on percussion. Dose, gr. $ss-j$.

Physiological Action.—The Nitrites agree in their general action, producing great vascular dilatation and consequent lowering of blood-pressure, by detonizing the muscular coat of the arterioles; tumultuous action of the heart, by depression of its inhibitory centre, and by reflexes to balance the fall in B. P.; diminished sensation, motion and reflexes; a sensation of heat, but lowered body-temperature; accelerated respiration from impairment of the ozonizing function of the blood, throbbing pain in the head, beating carotids, flushed face and vertigo. They are all muscle depressants.

Amyl Nitrite is the most prompt, but least enduring in action, and is best given by inhalation. *Sodium Nitrite* acts similarly, but less promptly. *Nitroglycerin* is less prompt and less violent, has a more enduring action, and is therefore more suitable for internal administration. Its headache is of intense frontal character, and persists for hours after the other effects have passed off, but lessens with tolerance.

Therapeutics.—The Nitrites are well used in:

Angina Pectoris, especially when characterized by a great rise of arterial tension, Amyl Nitrite inhaled, to lessen the arterial spasm and palliate the agony of the attack, is usually very efficient.

Epilepsy, when the aura is felt, the inhalation of a drop or two of Amyl Nitrite will occasionally abort the paroxysm.

Respiratory Neuroses, as spasmodic asthma, whooping-cough, laryngismus stridulus, etc., are believed in many cases by these agents.

Tetanus is palliated by Amyl Nitrite, especially during the period of fixation of the muscles of respiration.

Neuralgic Dysmenorrhœa has often been benefited by Nitroglycerin.

Vomiting and *Nausea*, also *Sea-sickness*, are benefited by the Nitrites.

Cold Stage of Intermittents and pernicious remittents may be aborted by the inhalation of Amyl Nitrite, preventing internal congestions.

Chronic Interstitial Nephritis, Nitroglycerin has proved of great value, in relieving the heart in its efforts against high arterial resistance. Also helps to prevent apoplexy in nephritis.

Migraine, of pale-face form, Amyl Nitrite is indicated, or Nitroglycerin. *Convulsions*, of various kinds, including puerperal, the Nitrites may be useful.

High Arterial Tension, from any cause, as in asthma, angina pectoris, arterio-sclerosis, interstitial nephritis, gout, lead poisoning, etc., Tetrannitrin is highly recommended, and any Nitrite will be found useful.

MOTOR EXCITANTS

The Motor Excitants include agents which have many other actions, some of which agents are often classified as Cardiac Stimulants (*Nux Vomica*, *Digitalis*, etc.), others as Cardiac Depressants (*Pilocarpus*), many as Diuretics (*Scilla*, etc.), others as Oxytocics (*Ergot*), and one as a Respiratory Stimulant (*Strychnine*).

NUX VOMICA

Source and Composition.—The seeds of *Strychnos Nux-vomica*, an East Indian tree of the order Loganiaceæ. It contains 2 alkaloids, *Strychnine* and *Brucine*, which in the plant are combined with *Igasuric Acid*; also the glucoside *Loganin*. Dose, gr. ss-jss [av. gr. j].

Preparations, Alkaloids, etc.

Extractum Nucis Vomica, Extract of Nux Vomica. Dose, gr. $\frac{1}{8}$ – $\frac{3}{4}$ [av. gr. $\frac{1}{4}$], up to a maximum of gr. ij in 24 hours.

Fluidextractum Nucis Vomica, Fluidextract of Nux Vomica, should have 23 per cent. of the alkaloids. Dose, ℥ss-jss [av. ℥j].

Tinctura Nucis Vomica, Tincture of Nux Vomica, should have at least 2.3 per cent. of the alkaloids of Nux Vomica. Dose, ℥v–xv [av. ℥viij].

Strychnina, Strychnine, $C_{21}H_{22}N_2O_2$, intensely bitter even in 1 to 700,000 solution, almost insoluble in water. Is a constituent of the Compound Laxative Pill. Dose, gr. $\frac{1}{100}$ – $\frac{1}{30}$ [av. gr. $\frac{1}{40}$].

Strychnina Sulphas, Strychnine Sulphate, soluble in 50 of water. Dose, gr. $\frac{1}{100}$ – $\frac{1}{20}$ [av. gr. $\frac{1}{40}$], but much larger doses may be used.

Strychnina Nitras, Strychnine Nitrate, soluble in 90 of water, and in 3 of boiling water. Dose, gr. $\frac{1}{100}$ – $\frac{1}{20}$ [av. gr. $\frac{1}{40}$], or more.

**Brucina*, Brucine, $C_{23}H_{26}N_2O_4$, seldom used. Dose, gr. $\frac{1}{10}$ – $\frac{1}{6}$.

Strychnine is an ingredient of Iron and Strychnine Citrate, also of the Elixir, Glycerite and Syrup of the Phosphates of Iron, Quinine and Strychnine (see under PHOSPHATES).

Physiological Action.—In small doses Nux Vomica acts as a bitter tonic, stimulates respiration, secretion, appetite and digestion, and sharpens the special senses. It increases peristalsis, stimulates slightly the inhibitory apparatus of the heart, and raises arterial tension by stimulating the vaso-motor centre; and remarkably heightens synaptic conductivity in the anterior columns of the spinal cord.

By a full dose (Strychnine gr. $\frac{1}{10}$), the pupils are dilated, the limbs jerk, respiration becomes spasmodic, the lower jaw stiff; a sensation of cerebral tension, shuddering and anxiety supervenes, and the face wears an unmeaning smile.

A Toxic Dose (gr. $\frac{1}{2}$), on an empty stomach quickly produces heightened reflexes; tonic spasms, especially of the extensor muscles, quickly succeed each other, with intervals of repose; resulting, after two or three hours at most, in death by asphyxia, from tetanic fixation of the

muscles of respiration; consciousness being preserved until CO_2 narcosis sets in. Not a constant result.

Strychnine exalts *all* the functions of the spinal cord, reflex, motor, vaso-motor, and sensory, the latter being least affected. It acts by depressing synaptic resistance, and by extending the motor area. A large dose destroys the spinal functions as by one blow. It does not affect the brain directly.

Brucine has only one-twelfth the strength of Strychnine, but otherwise corresponds with it physiologically and therapeutically.

Thebaine, the tetanizing alkaloid of Opium, has an action very similar to that of Strychnine, being a powerful spinal exaltant.

Strychnine-spasms are differentiated from Tetanus-spasms by remembering that the former are intermittent, the latter constant. Furthermore, the meaningless smile, the less marked trismus, the absence of a wound, the rapid course of the symptoms, all point to the action of Strychnine.

Treatment of Strychnine Poisoning.—The *antidote* is Tannic Acid, to form the insoluble tannate. Then emetics or the stomach-pump, followed by *perfect quiet*, which is very important. *Antagonists* are Chloral, *Chloroform*, Physostigma, and Potassium Bromide, the latter being so slow of action that it is rarely available. The bladder must be frequently evacuated, to prevent reabsorption.

Tests for Strychnine.—Strychnine and its salts dissolve without color in concentrated Sulphuric Acid, but, on adding to the solution some deoxidizing substance, a play of colors results; *Lead Peroxide* producing a beautiful blue, passing into violet, then red, and finally yellow (Marchand). A minute quantity of *Potassium Bichromate* produces similar results (Otto), while *Cerous-ceric Oxide* causes a blue, changing to violet and then to a permanent cherry-red. If these tests are carefully applied, as minute a quantity as 1 part in 900,000 of the solution may be detected (Wenzell). A similar blue-violet reaction is produced when a mixture of Hydrastine 1 and Morphine 9 is acted on by Sulphuric Acid and Potassium Bichromate, or by Sulphuric Acid alone (Lloyd); but the occurrence of the reaction with the acid alone serves to distinguish the mixed alkaloids from Strychnine, which dissolves in sulphuric acid without producing any color.

Therapeutics.—Nux Vomica and its chief alkaloid hold high rank as

respiratory, cardiac, muscular and nervous stimulants and stomachic tonics. These powerful poisons are equally powerful remedies in:

Atonic Dyspepsia, Tincture of Nux Vomica, gtt. v *ter die*, before meals.

Gastric Catarrh, especially that of drunkards, the Tincture is excellent, and gives satisfaction if a little Capsicum is given with it.

Constipation, when atony of the bowels, the Tincture in 10-drop doses is very efficient; not as a purgative, but by increasing peristalsis.

Cardiac Depression, Nux Vomica in small doses, frequently. Value has been much overestimated.

Dyspnœa from pulmonic affections, Nux Vomica as a respiratory stimulant.

Nervous Cough, and the cough of habit, Nux Vomica is often curative.

Vomiting of Phthisis, Nux Vomica is generally one of the best remedies.

Intermittents, as adjunct to Quinine, Strychnine is used advantageously.

Opium poisoning, Strychnine is powerfully antagonistic to Morphine; as a respiratory stimulant.

Anæmia and Chlorosis, Strychnine with Iron and Quinine, is invaluable.

Tetanus, especially the idiopathic type, has been often cured by Strychnine (?).

Neuralgias, especially the visceral, Strychnine in very small doses.

Hemiplegia, not when recent, nor when the muscles have lost their electrical contractility, but when degeneration is about to set in, Strychnine is an excellent remedy in some cases.

Diphtheritic Paralysis are almost invariably helped by Strychnine.

Amaurosis, from lead, tobacco or alcohol, Strychnine has proved useful.

Chronic Alcoholism, Strychnine in full doses, hypodermically, thrice daily, has been used for many years, and is the basis of the so-called "Bichloride-of-Gold" cures.

*IGNATIA—St. Ignatius' Bean

Source and Composition.—The seeds of *Strychnos Ignatii*, or Ignatia Amara, a tree of the order Loganiaceæ found in the Philippine Islands. They contain the same ingredients as Nux Vomica, though having a much larger proportion of Strychnine, about 1 per cent., against $\frac{1}{8}$ or $\frac{1}{2}$ per cent.

**Tinctura Ignatii*, Tincture of Ignatia. Dose, Mij- \bar{x} .

Physiological Action.—Ignatia closely resembles Nux Vomica in action, a poisonous dose producing similar exaltation of the spinal functions,

muscular writhing and tetanic spasms, resulting in death by asphyxia. It especially exalts the susceptibility of the sensory nerves, and those of special sense, for a time; the exaltation being succeeded by an opposite condition, manifested by numbness and torpor, with great mental depression. It causes a feeling of constriction about the throat, and a sensation of intense anguish at the pit of the stomach.

Therapeutics.—Ignatia is warmly recommended for:

Hysteria, to control the general hyperæsthesia, insomnia, clonus hystericus, mental excitement or depression, aphonia, diseased appetite, convulsive crying or laughing, etc. (Phillips and Piffard).

Cerebro-spinal Irritability may be diminished by small doses, though excited by large ones.

Globus Hystericus may often be removed by Ignatia in small doses.

*PICROTOXINUM—Picrotoxin

Picrotoxin, or *Picrotoxic Acid*, is a neutral principle prepared from the seeds of *Anamirta paniculata*, or *Menispermum Cocculus*, an Asiatic climbing plant, of the nat. ord. Menispermaceæ, the berries of which are called *Cocculus Indicus*, or Fish-berries. Besides *Picrotoxin*, the active principle, the shells of the seeds contain two other principles, *Menispermin* and *Paramenispermin*, which are inert; also *Hypopicrotoxic Acid*.

Preparations.—Picrotoxin is official in the Br. Phar.

**Picrotoxinum*, gr. $\frac{1}{100}$ – $\frac{1}{25}$ in pill by stomach, or gr. $\frac{1}{100}$ – $\frac{1}{40}$ hypodermically.

**Tinctura Cocculi* (1 to 8) Mij–xv.

Physiological Action.—Picrotoxin is a cerebro-spinal excitant, affecting especially the centres in the medulla oblongata, and representing the combined action of *Belladonna* and *Nux Vomica*. It causes muscular twitching, incoördination, stupor, delirium, epileptiform convulsions, tonic, and clonic spasms alternating, exalted reflexes, trembling, then coma, insensibility, and death by paralysis of the heart. The drug irritates the centres in the medulla and stimulates the reflex centres in the cord. It stimulates all secretions, but especially the intestinal, causes nausea and vomiting, and slows the heart by stimulating inhibitory centre, accelerates respiration by centric stimulation, and increases arterial tension by stimulation of the vaso-constrictor centres in the medulla and upper part of the cord.

Cocculus berries are used to adulterate beer, in order to make it more bitter and intoxicant.

Differences between Picrotoxin and Strychnine Spasms.—The spasms caused by Picrotoxin are choreic and chiefly affect the flexor muscles; those from Strychnine are tetanic, affecting principally the extensors.

Antagonists.—*Chloral* is antagonistic to its cerebral and spinal actions, but synergistic to its depressing power over the heart and respiration. *Acetic Acid* gives relief in overdosing, and may have some antidotal power. *Anæsthetics* antagonize its spasm-producing action.

Therapeutics.—Picrotoxin is used chiefly in nervous diseases.

Epilepsy is amenable to it, especially in anæmic subjects, and where the attacks are nocturnal in time.

Paralyses, where there is a sense of giddiness, and lightness in the head.

It is especially good in paralysis of the sphincters, and in hemiplegia brought on by cold, as facial paralysis, etc.

Chorea is well treated by Picrotoxin, but requires full doses.

Dysmenorrhæa is often benefited by the Tincture of Cocculus commenced two days before the stated period, and continued throughout it.

Sweats of Phthisis may be arrested for days by Picrotoxin, gr. $\frac{1}{200}$ – $\frac{1}{100}$.

Parasitic Skin Diseases, Picrotoxin as Ointment, gr. x ad ʒj.

Pediculi may be killed by the Ointment, but care should be taken to avoid using it on an abraded surface, lest poisoning result.

ERGOTA—Ergot

Ergota, Ergot of Rye, the sclerotium (intermediate fibrous stage) of *Claviceps purpurea*, a fungus replacing the grain of *Secale cereale* (rye). and growing within its flower. Dose, gr. x–ʒj [av. gr. xxx].

The chief constituents of Ergot are as follows:

1. *Ergotoxine*, an unstable, alcoholic extract, responsible for the principal uterine and vascular effects. By loss of water ergotoxine becomes converted into
2. *Ergotinine*, a weak crystalline alkaloid, insoluble in water.
3. Para-hydroxyphenylethamine, or Tyramine, a substance similar to epinephrine both in structure and in action; it is the chief agent producing the pressor effect.

4. *Betaiminazolyethylamine*, or Histamine, a substance which has a lowering effect on blood-pressure, and a strong stimulant effect upon the excised uterus.

**Ustilago Maydis*, Corn, Ergot, grown upon *Zea Mays*, the Indian corn or Maize; probably has a similar composition. One of its constituents is a volatile principle named *Secaline*, supposed to be identical with Trimethylamine. Dose of the fluidextracts, ʒss-ij.

Preparations.

Extractum Ergotæ, Extract of Ergot (Ergotin); *Squibb's* is a good preparation and represents the power of the drug. Dose, gr. ij-x [av. gr. iv].

Fluidextractum Ergotæ, Fluidextract of Ergot. Dose, ℥x-ʒj [av. ℥xxx].

**Vinum Ergotæ*, Wine of Ergot, has 20 per cent. of the fluidextract. Dose, ʒj-iv [av. ʒij].

**Ergone* is the trade name of a fluidextract from which the inert, irritant and depressant principles have been removed as far as possible. It contains Chloretone as a preservative. Dose, ℥x-ʒj.

Physiological Action.—Ergot is a motor excitant, a vaso-constrictor, a cardiac sedative, and a stimulant of involuntary muscular tissue. It is hemostatic, ecbotic, anhidrotic, and convulsant. After a *full* dose there is at first a brief fall of the blood-pressure, due to the depressant action of the drug on the heart; but the vessels soon contract throughout the body, and the blood-pressure is greatly raised. This effect is generally believed to be due to stimulation of [both the vaso-motor centre in the medulla and] the vaso-constrictor nerve terminations, especially of the splanchnic area. A very large dose depresses both the heart and the vaso-motor centre, the primary fall of blood-pressure continues, and progressive paralysis of the cardiac and vaso-motor apparatus results.

Ergot causes powerful contractions of the parturient uterus by stimulating the myo-neural junction of the hypogastric nerve. This action is not so constant on the impregnated but not parturient womb, and though it often produces abortion it frequently fails to initiate uterine contraction in pregnant women. It arrests post-partum hemorrhage by laterally closing the blood outlets in spite of the increased pressure in the vessels. It decreases intestinal peristalsis, blanches the intestinal vessels, and lessens the secretion of the urine, saliva, sweat, and milk.

The phenomena produced by Ergot are divided into two classes, according as the drug is taken in large quantity for a short time, or in small doses for a considerable period. In a large dose it acts as a gastro-

intestinal irritant, causing nausea and vomiting, gastralgia, colic, thirst, and purging. It slows the heart, raises the arterial tension greatly, dilates the pupils and produces pallor, vertigo and frontal headache. It stimulates the contraction of unstriated muscular fibre, especially affecting the sphincters and causing contraction of the sphincter of the bladder, making micturition difficult if not impossible. It produces cerebral and spinal anæmia, a great fall of the body-temperature, coldness of the surface, tetanic spasms, and violent convulsions. A very large dose is necessary to cause these results, and as much as ʒiij of the fluidextract have been given daily for a week or more, without producing any marked effect.

Chronic Ergotism occurs in two forms, the convulsive and the gangrenous, either usually excluding the other. The convulsions are tetanoid spasms of the flexor muscles, the uterus, the intestinal fibres, and the muscles of respiration, ending in coma and death by asphyxia. The gangrenous form begins with coldness and numbness of the limbs, formication of the skin all over the body, loss of sensibility and abolishment of the special senses, bullæ of the blood and ichor, followed by dry or moist gangrene of the lower extremities, buttocks and other parts, epileptiform convulsions, coma and death. Autopsies show changes in the posterior columns of the cord, resulting probably from spinal anæmia.

Experiments with the various derivatives of Ergot show that no one of its constituents possesses the power of the drug itself. Its actions on the circulation and the uterus are ascribed to Ergotoxin, its convulsant action to Tyramin, and its effect on the heart and the stomach to Histamine.

Therapeutics.—Ergot has a field of usefulness, but not as wide as formerly supposed, since its use for any considerable period may result in chronic poisoning. In:

Lax Sphincters of the rectum and bladder are contracted by Ergot.

Acute Dysentery in the congestive stage is well treated by full doses.

Hemorrhoids are well treated by Ergot locally, but not internally, as it promotes venous congestion when so administered.

Mania due to cerebral hyperæmia, Ergot is a very useful remedy.

Headache, Migraine, etc., of congestive form, Ergot acts very well.

Myelitis and Spinal Congestion, large doses may prove helpful.

Splenic Enlargement, Da Costa has found that Ergot administered internally will reduce the size of an enlarged spleen.

Incontinence of Urine, from paralysis of the sphincter vesicæ.

Uterine Affections, as chronic metritis, subinvolution, fibroids and polyp, congestive dysmenorrhœa, etc., Ergot causes firm contraction of the organ, and promotes the absorption in some cases.

Obstetrics. Here Ergot is much used, and often very injuriously. Producing continuous uterine contractions, instead of the natural ones (which are intermittent), it should never be used when there is any obstacle in front of the child. Dangers are rupture of the uterus, laceration of the perineum, paralysis of the fetal heart. If employed during labor at all, which is now considered doubtful, it is only permissible at the end of the second stage, when the head is born, in order to promote uterine contraction and expulsion of the placenta, and to guard against post-partum hemorrhage.

Some very able students contend that ergot has no superior usefulness outside the field of obstetrics.

DIGITALIS

Source.—Digitalis consists of the dried leaves, collected from plants of the second year's growth, of *Digitalis purpurea*, the Purple Foxglove, a plant of the nat. ord. Scrophulariaceæ, which grows wild in Europe, and is cultivated in this country, often in private gardens, for its beautiful spike of purple flowers, and largely by the Shakers for the drug market. Dose, gr. ss-ij [av. gr. j].

Much of the leaf found in our shops is of very poor quality, a large proportion being inert; but whether this is due to our Phar. not restricting the official drug to the wild plant, or to careless treatment in gathering and drying, is not definitely known. When, however, the leaves are imperfectly dried, a process of decomposition sets in, which destroys the active principles, and may produce new and poisonous ones. A similar decomposition is said to occur whenever the tincture of Digitalis is mixed with watery or syrupy solutions. Certain it is, at any rate, that Digitalis is one of the most unreliable drugs, in respect of the physiological activity of any particular sample or preparation. The seeds are known to contain the active principle in much greater proportion than the leaves, but they are never used.

Composition.—Schmiedeberg's latest analysis is accepted as the most accurate determination yet obtained of this vexed question. He enumerates five principles, as contained in Digitalis, viz.: (1) *Digitalin*, amorphous, insoluble in water, but partly soluble in alcohol; the active ingredient of Homolle's French Digitaline and the Digitalin formerly official in the U. S. and Br. Pharmacopœias; (2) *Digitoxin*, insoluble in water and freely soluble in alcohol; the most active of all, and the principal constituent of Nativelle's prize Digitaline; (3) *Digitalin*, soluble in

both water and alcohol; (4) *Digitonin*, readily soluble in water, sparingly so in alcohol; active, but acts like *Saponin*, forming a solution which froths easily and antagonizes the other three; (5) [*Digitin*, which seems to be entirely inert]. The first three are cardiac poisons, the fourth antagonizes them; all five are non-nitrogenous, and except *Digitin*, are generally considered to be glucosides, though some authorities hold that *Digitoxin* is an alkaloid.

Preparations, vary greatly in results, by reason of the different solubilities and actions of the active principles:

**Extractum Digitalis*, Extract of *Digitalis*, prepared by evaporating the fluidextract. Dose, gr. $\frac{1}{8}$ – $\frac{1}{2}$ [av. gr. $\frac{1}{6}$].

Fluidextractum Digitalis, Fluidextract of *Digitalis*. Dose, ℥ss–iij [av. ℥j].

Tinctura Digitalis, Tincture of *Digitalis*, 10 per cent. strength. Dose, ℥v–xv [av. ℥viii].

Infusum Digitalis, Infusion of *Digitalis*, 1½ per cent., with Cinnamon Water 15. Dose, ʒj–ij [av. ʒj]. Notice that the dose is in drachms, not ounces.

**Digitalinum*, Digitalin, the complex product of the process formerly official in the U. S. Pharmacopœia. Dose, gr. $\frac{1}{60}$ – $\frac{1}{30}$.

Note on the Preparations.—Of the above, the *Tincture* and *Fluidextract*, being alcoholic preparations, contain a large proportion of *Digitalin*, *Digitalein*, and *Digitoxin* with a small proportion of *Digitonin*. The *Infusion* contains a larger proportion of *Digitonin* than of the others, some *Digitalein*, and little or no *Digitoxin* or *Digitalin*. It is best for diuretic action, the *Tincture* for acting upon the heart; but to obtain the action of the plant itself, the powdered leaves must be used in pill or capsule.

Physical Action.—*Digitalis* is a cardiac tonic and a vascular irritant, also motor-excitant, paralyzant, diuretic and emetic. In overdoses it irritates the mucous membranes, causing sneezing, severe gastric disturbance, nausea, vomiting, colic and purging, the discharges being of a grass-green color. It lowers temperature, probably by lessening the blood-supply to the tissues, produces headache, irregularity of the heart's action, vertigo and an appearance of vibratory fringes of color around objects.

The Heart is slowed by *Digitalis*, but its force is at the same time increased. The drug stimulates the cardiac motor ganglia, thereby extending and energizing systole; the inhibitory apparatus, thereby prolonging diastole; and the vaso-motor centre, contracting the arterioles, and thereby raising arterial tension. Full doses continued exhaust the

irritability of the motor ganglia and disorganize the cardiac action. The recumbent posture must be maintained when *Digitalis* is given for its full cardiac effects. Its general effect on striped muscular tissue is to lessen the contractile power, causing great weakness and languor.

The *Diuretic Action* of *Digitalis* is probably due to its peculiar influence upon the general and renal circulation, it increasing the force of the ventricular contractions, while at the same time one of its constituents, *Digitalin*, contracts the blood-vessels of the body, the two others, *Digitoxin* and *Digitaloin* dilate the renal arteries (?). The effect of this combined action is to greatly raise the arterial tension and the blood-pressure in the glomeruli, their efferent vessels being contracted; while the rapidity of the renal circulation is increased and its volume augmented, by the greater force of the heart-beat and the dilatation of the afferent vessels. No other drug known has this double power, and therefore, so far as vascular action is concerned, *Digitalis* is the ideal diuretic. Still, while its power to produce diuresis in cardiac disease is unquestioned, most observers find only small increase in health. Much uncertainty exists as to its effect upon the constituents of the urine, some maintaining that it increases the elimination of urea, others that this is diminished, and still others that it is at first increased and afterwards diminished. It is slowly absorbed, and slowly eliminated by the kidneys.

Lethal Doses lessen the reflexes by stimulation of Setschenow's centre, and paralyze the muscles and peripheral nerves, motor and sensory. Respiration, at first slowed, becomes rapid and feeble; cyanosis, coma and convulsions follow, and death by sudden paralysis of the heart, which is arrested in systole.

Aconite Compared with Digitalis.—*Aconite* at first stimulates but soon relaxes inhibition, and depresses the cardiac motor ganglia; *Digitalis* increases inhibition, and stimulates the cardiac muscle. Both drugs finally paralyze the heart, *Aconite* by direct depression, *Digitalis* by overstimulation. Under *Aconite*, the heart is arrested in diastole, under *Digitalis*, in systole. The arterial tension is lowered by *Aconite*, raised by *Digitalis*. *Aconite* acts quickly; *Digitalis*, very slowly; a fact which makes the latter drug of little value in poisoning by the former. Both drugs slow the heart, but otherwise antagonize each other in their cardiac actions

Antidotes and Antagonists.—The chemical antidote is *Tannic Acid*, but as the tannate is not inert, the stomach should be evacuated. *Aconite*

is the best antagonist to the effects of large doses, *Opium* to those of its long-continued use. *Saponin* and *Senegin* are considered to be its most complete physiological antagonists.

Therapeutics.—*Digitalis* is said by Phillips to be particularly adapted to blondes, and persons of sanguine and indolent temperament. Its chief uses in disease are based on its properties as a heart tonic and a diuretic. In:

Mitral Disease, when the heart is rapid and feeble, it moderates hyperæmia of the lungs, and engorgement of the pulmonary veins, by giving the auricle time to empty itself through the obstructed orifice.

Aortic Disease, *Digitalis* gives relief when the cardiac muscle fails, and compensatory hypertrophy has not set in. Otherwise it will not.

Irritable Heart of soldiers, Da Costa finds it often curative.

Dilated Right Heart, *Digitalis* gives relief.

Palpitation, *Cardiac Depression*, *Venous Engorgement*, are all well treated by the Tincture of *Digitalis*, in medium doses, given on bread pill or sugar.

Simple Hypertrophy, *Pericarditis*, *Fatty Heart*, are conditions in which *Digitalis* must not be used, except temporarily for special reasons.

Dropsy, both cardiac and renal, *Digitalis* is well indicated. The Infusion is regarded as the best diuretic, while alcoholic preparations (tincture, fluidextract), are employed to act on the heart.

Pneumonia, and other inflammations, in first stage, it is useful.

Hemorrhage from a large surface, and in the hemorrhagic diathesis.

Congestive Headache, *Hemicrania*, etc., it raises the vascular tone.

Exophthalmic Goitre, *Digitalis* is an excellent remedy (?).

Cumulative Action of *Digitalis*.—During a course of this drug sudden alarming symptoms may arise, due to exhaustion of the cardiac motor ganglia. They may be prevented by strictly maintaining the recumbent posture, and stopping the remedy for a few days in every two weeks. An absolute minimum of dosage should be determined.

**Adonis Vernalis* is a plant of the nat. ord. Ranunculacæ (which includes *Aconite*, *Pulsatilla*, *Podophyllum*, etc.). It contains a glucoside named *Adonidin*, which acts almost exactly like *Digitalin*, but is much more powerful, and without any cumulative property. [This statement requires experimental verification.] It has been used largely in Europe for cardiac failure due to organic lesion, but is thought to be less certainly beneficial in valvular diseases than *Digitalis*. Besides its power

as a cardiac tonic, it is also diuretic, and is very liable to produce vomiting and diarrhoea. The infusion (3ss-ij of the root to 3vj of water) may be given in doses of 3ss every 2-4 hours, or Adonidin itself, in doses of gr. $\frac{1}{8}$, four to six times daily.

**Erythrophloeum*, Casca Bark (Sassy Bark, Ordeal Bark), is the bark of *Erythrophloeum Guinense*, an African tree of the nat. ord. Leguminosæ; used by the negroes as an ordeal in witchcraft trials. When used in quantity, it causes severe cephalalgia, nausea and vomiting, narcosis and death. It is used in Africa as a remedy for intermittents, dysentery and colic; and in England it is believed to resemble Digitalis in its action on both the circulation and the renal secretion. It contains a poisonous glucoside, *Erythrophloëin*, which seems to combine the properties of both Digitalin and Picrotoxin, causing convulsions like the latter agent. It has been used with asserted benefit in dilated heart, also in mitral disease and dropsy. Dose of the tincture (1 in 10), Mv-x; of the watery extract, gr. ss-j.

STROPHANTHUS

Source and Composition.—Strophanthus is the ripe seed, deprived of long awn, of *Strophanthus Kombé* (nat. ord. Apocynaceæ), an African climbing plant, from which the natives extract a poisonous preparation known as the Kombé arrow-poison. It contains a crystalline glucoside, *Strophanthin*, the active principle, which is plentiful in the seed (8 to 10 per cent.) and is an agent of great energy, the frog being killed by a solution of 1 in 10,000,000. (Denian.) Dose of Strophanthus, gr. ss-ij [av. gr. j].

Preparations.—Professor Frazer recommends the tincture. *Tinctura Strophanthi*, Tincture of Strophanthus, 10 per cent. Dose, Mv-x [av. Mvii], or Mss-ij frequently repeated. *Strophanthinum*, Strophanthin. Dose, gr. $\frac{1}{100}$ - $\frac{1}{60}$ [av. gr. $\frac{1}{60}$]; gr. $\frac{1}{60}$ has been used, the influence of the one injection upon the circulation lasting at least 8 days. Soluble in water and in alcohol.

Physiological Action.—Strophanthus acts primarily upon muscular tissue, by direct contact through the blood, and with great energy. It increases the contractile power of all striped muscle, and in poisonous quantity it fixes the muscular contraction into a condition of tetanic permanence, the muscle being unable to resume its normal condition of partial flexibility.

Small doses stimulate the cardiac contractions, increasing the force of the ventricular systole and lowering the rate of the heart-beats. At the same time the general blood-pressure is raised and diuresis produced, both being due to the direct stimulation of the circulation from behind. Large doses paralyze the heart in systole, and leave the cardiac muscle in a state of contraction resembling cadaveric rigidity. It does not act through the nervous system, but paralyzes muscular tissue, striated and non-striated, by direct contact; and when contractility has been once destroyed thereby, no stimulus will re-excite it. It does not affect the vascular system directly.

Compared with *Digitalis*, then, we have in *Strophanthus* a much more powerful cardiac stimulant, differing from *Digitalis* in not producing vaso-motor constriction of the arterioles. It reduces the pulse, lowers body-temperature somewhat, is not cumulative in action, and does not cause any gastro-intestinal disturbance. It is diuretic, by direct stimulation of the renal circulation.

Strophanthin, besides its cardiac and renal actions, is a powerful local anæsthetic; also a myotic when applied to the conjunctiva, though it is too irritating for general use.

Therapeutics.—*Strophanthus* is a valuable cardiac stimulant, from the rapidity and permanence of its action, as well as its non-interference with the calibre of the peripheral vessels. It relieves cardiac dyspnœa promptly; in less than an hour it modifies the pulse-rate, and the influence of a single dose upon the circulation persists for a long time. It may replace *Digitalis* in the treatment of chronic Bright's disease and valvular lesions of the heart, where it is important that the work of the heart should not be increased by any additional resistance in the arterial system. It is reported as highly useful in many cardiac and renal affections; but the claims made for it have not been corroborated.

CIMICIFUGA

Source and Composition.—The dried rhizome and roots of *Cimicifuga racemosa*, Black Cohosh, an indigenous plant of the nat. ord. Ranunculaceæ. It contains a Volatile Oil, two Resins, Tannic Acid, etc. The active principle has not been isolated.

Preparations.—They should be made from the fresh root, though the dried root is official.

Extractum Cimicifugæ, Extract of Cimicifuga. Dose, gr. j-vj [av. gr. iv].

Fluidextractum Cimicifugæ, Fluidextract of Cimicifuga. Dose, ℥v-xxx [av. ℥xv].

**Tinctura Cimicifugæ*, Tincture of Cimicifuga, 20 per cent. strength. Dose, ℥x-3ij [av. 3j].

**Macrotin* is an impure resin precipitated by water from a concentrated alcoholic preparation. Dose, gr. ss-ij.

Physiological Action.—Cimicifuga is motor-excitant, anti-spasmodic, diaphoretic, diuretic, and expectorant. It acts similarly to Digitalis on the heart and circulation, and similarly to Ergot on unstripped muscular fibre, but is much feebler in activity than either. Its taste is bitter and nauseous, resembling that of Opium. Small doses stimulate digestion and secretion, especially the secretions of the bronchial mucous membrane and the kidneys. It also stimulates the menstrual flow. Full doses slow the heart-rate while increasing its force, raise arterial tension, and stimulate uterine contraction. In large doses it dilates the pupils, and causes dim vision, vertigo, intense headache, nausea, vomiting, and in some persons sopor. [The experimental evidence is as yet too limited for reliable conclusions as to efficiency.]

Therapeutics.—Cimicifuga is safer than Digitalis, and might possibly be used where the latter drug is contraindicated. In:

Cardiac Diseases, it is used especially in weak or fatty heart, where Digitalis would be dangerous.

Chorea, about the age of puberty, Cimicifuga is often successful.

Puerperal Hypochondriasis has been completely removed by it.

Bronchitis, acute and chronic, it is valuable as an expectorant (?).

Rheumatism, of the localized muscular variety, as lumbago, torticollis, pleurodynia, intercostal rheumatism, is sometimes benefited by Cimicifuga.

Neuralgia, of various kinds, especially ovarian, also in neuralgic and congestive dysmenorrhœa, it may be efficient.

Uterine Disorders, as subinvolution, in which it is given with Ergot.

Delirium Tremens, Cimicifuga is used as a nerve-tonic.

In Obstetrics, to initiate uterine contraction, to allay after-pains and nervousness after delivery, and to check hemorrhage.

CONVALLARIA

Source and Composition.—It is the dried rhizome and roots of *Convallaria majalis*, the Lily of the Valley, a well-known perennial of the nat. ord. Liliaceæ. It contains two active glucosides, viz.:

Convallamarin, the cardiac-acting principle, soluble in both alcohol and water, and *Convallarin*, an emeto-cathartic, soluble in alcohol but insoluble in water; also an acrid *Resin*, which acts similarly to the latter principle, and probably contains it.

Preparations.—Formerly one was official:

**Fluidextractum Convallariæ*, Fluidextract of Convallaria, an alcoholic preparation, containing Convallarin. Dose, Mij-x [av. Mviiij].

**Infusum Convallariæ*, Infusion of Convallaria, probably contains no Convallarin, it being insoluble in water. Dose, ℥ss-ij.

**Convallamarinum*, Convallamarin, an amorphous, white, bitter powder, soluble in water and in alcohol, but not in ether. Dose, gr. ¼-ij.

Physiological Action.—Convallaria acts similarly to Digitalis, being motor-excitant, a gastro-intestinal irritant, a cardiac stimulant, and a diuretic. In medicinal doses it slows and strengthens the contractions of the heart, raises arterial tension, slows and deepens the respiration, and increases the urinary discharge. Lethal doses cause irregular cardiac action, with rapid and feeble pulsations; also extreme slowing of the respiration, greatly lowered blood-pressure, and finally arrest of the heart in systole, by direct stimulation of its inhibitory apparatus. Preparations of the root, and alcoholic preparations of the whole plant, are liable to excite emeto-catharsis, which is due to the resin and the Convallarin. The powdered root is sternutatory.

Therapeutics.—Long known as an efficient cathartic and diuretic, Convallaria then came into prominence as a cardiac tonic, being considered safer than Digitalis, as it has no cumulative action, and does not disturb the stomach or the cerebro-spinal functions, if preparations devoid of Convallarin be used. It has been exceedingly well administered in many forms of heart-disease, particularly in:

Mitral Stenosis or Insufficiency, characterized by arrhythmia, pulmonary congestion, cardiac asthma; also in dropsy due to cardiac disease, Convallaria has given good satisfaction.

Aortic Regurgitation, it relieves many of the most distressing symptoms. *Valvular Affections of the Heart*, generally, when accompanied by dropsy

and weak cardiac action, *Convallaria* is an efficient remedy, but is no longer in repute.

SCOPARIUS—Broom

Source and Composition.—The tops of *Cytisus Scoparius*, the common Broom, a well-known garden shrub of the nat. ord. Leguminosæ. It contains a neutral, crystalline principle, named *Scoparin*, and a liquid, volatile, poisonous alkaloid, *Sparteine*, which contains no oxygen, but has decided basic qualities. Dose of *Scoparius*, gr. v-xxx [av. gr. xv].

There are no official preparations.

Sparteina Sulphas, Sparteine Sulphate. Dose, gr. $\frac{1}{6}$ - $\frac{1}{2}$ [av. gr. $\frac{1}{6}$] hypodermically, gr. ss-ij by mouth. Small doses (gr. $\frac{1}{6}$ - $\frac{1}{4}$) every 5 hours for cardiac action; larger (gr. j-ij) for diuresis (Clarke). Larger doses if necessary, say gr. jss-ijj, thrice daily (Prior).

Physiological Action.—Broom-tops are diuretic and laxative, also emetic in large doses. In decoction they have long been a favorite diuretic and vehicle for other diuretics in the treatment of dropsies, both cardiac and renal, but are considered most reliable in the dropsy of renal origin.

In small doses Sparteine slows and weakens the heart-beats, due to a general depression of the motor nerve terminations and of the sympathetic ganglia. The respiration, at first quickened, is soon slowed and deepened, the patient having a sense of increased warmth and well-being, and if suffering from irregular cardiac action, præcordial distress and dyspnoea, these symptoms are usually relieved. If the pulse has been abnormally slow Sparteine will quicken it, though its general action is to slow the cardiac rate. An overdose brings on marked palpitation, a small and rapid pulse of very high tension, præcordial pain and a sense of "tightness" about the chest, with anxiety, and a feeling of intense debility, perhaps even muscular tremor. Death occurs by asphyxia from depression of both the centre and the muscles of respiration.

Sparteine acts directly on the cardiac muscle, as well as upon the inhibitory apparatus, generally slowing the pulse-rate. It also stimulates the vaso-motor centre to contract the vessels throughout the splanchnic area, thus increasing the circulation in the skin and kidneys, and raising arterial tension generally, though this increase is but slight. Its diuretic power on healthy persons is denied by some observers and affirmed by others, Cushny asserting that the diuretic action is due to the scoparin and not to the sparteine. It is due, also to the large amount of water

ingested with the infusion. More critical evidence as to its assumed diuretic action is needed.

Therapeutics.—Sparteine was formerly recommended for various forms of heart disease, but both experimental and clinical observations indicate that it is of no particular value in these conditions. "Sparteine is comparatively little used at the present time, and possesses no properties which are likely to reinstate it in favor."

Infusion of broom tops was long popular for its diuretic properties, but it is reasonably assumptive that hot water without the broom would be nearly as efficacious.

SCILLA—Squill

Source and Composition.—Squill is the sliced bulb of *Urginea maritima*, a perennial plant of the nat. ord. Liliaceæ, growing along the shores of the Mediterranean. Its active principle is probably the acrid, bitter glucoside, *Scillitoxin*, which it contains, along with Scillipicrin, Scillin, and Sinistrin. Dose of the dried bulb, in powder, gr. j–ij [av. gr. ij].

Preparations.

Fluidextractum Scilla, Fluidextract of Squill. Dose, ℥j–v [av. ℥jss].
Tinctura Scilla, Tincture of Squill, 10 per cent. Dose, ℥v–xxx [av. ℥xv].
Acetum Scilla, Vinegar of Squill, 10 per cent. Dose, ℥v–xxx [av. ℥xv].
Syrāpus Scilla, Syrup of Squill, has of the Acetum 45 per cent. Dose, ℥x–3j [av. ℥xxx].

Syrāpus Scilla Compositus, Compound Syrup of Squill. (Cox's Hive Mixture) has Squill, Senega, and Tartar Emetic, the latter in the proportion of about gr. j to the 3̄. Dose, ℥v–x, for children; ℥xx–xl [av. ℥xxx] for adults; as an emetic 3̄j–ij, according to age.

**Pilula Ipecacuanha cum Scilla*, Pill of Ipecacuanha with Squill (B. P.), contains about 5 per cent. of Opium. Dose, gr. iv–viii.

Physiological Action.—In small doses Squill is expectorant, in large ones it is emetic and diuretic, and in overdoses it is an irritant poison, causing nausea and vomiting, purging, gastro-enteritis, strangury, bloody urine, perhaps suppression, convulsions, and death by paralysis of the heart in systole. In medicinal doses it acts upon the circulation like Digitalis, slowing and strengthening the cardiac contractions, making the pulse slower and stronger, raising arterial tension, and increasing the flow of urine. The difference between its actions as an expectorant and a cardiac stimulant would seem to indicate its possession of two or more active

principles, one specifically affecting the secretory mucous membranes, and the other the circulatory apparatus.

Therapeutics.—Squill is a household remedy in many countries, especially in England, where it is freely used in domestic practice for coughs of infants and children, and causes many deaths by direct poisoning. It is chiefly employed as an expectorant and diuretic, though it renders excellent service as a cardiac stimulant. It is well used in:

Bronchitis, when the secretion, though profuse, is difficult to expel. If secretion be scanty, first give Ipecac; though there is reasonable doubt as to this alleged efficiency.

Chronic Bronchitis, the Pil. Ipecac cum Scilla of the Brit. Phar., gr. viij, night and morning, is a useful remedy.

Dropsy, of cardiac origin, Squill combined with Digitalis and Hydrarg. cum creta, gr. j of each, is an efficient diuretic, though superfluous.

Croup, the Compound Syrup, remembering that it contains Tarital Emetic and the liability to great depression therefrom.

Cardiac Disorders, as a stimulant to the heart, in cases where Digitalis would be considered dangerous.

PILOCARPUS—Jaborandi

Source and Composition.—The leaflets of *Pilocarpus microphyllus*, or *Pilocarpus Jaborandi*, Brazilian plants of the nat. ord. Rutaceæ, containing two chief alkaloids, *Pilocarpine* and *Jaborine*, which though isomeric are antagonistic in action; also a volatile oil and probably a peculiar acid.

Preparations and Derivatives.

Fluidextractum Pilocarpi, Fluidextract of Pilocarpus. Dose, ℞-xlv [av. ℞xxx].

Pilocarpinæ Hydrochloridum, Pilocarpine Hydrochloride, very soluble in water. Dose, gr. $\frac{1}{8}$ – $\frac{1}{2}$ [av. gr. $\frac{1}{6}$].

Pilocarpinæ Nitrates, Pilocarpine Nitrate, soluble in 4 of water. Dose, gr. $\frac{1}{8}$ – $\frac{1}{2}$ [av. gr. $\frac{1}{6}$].

Physiological Action.—Pilocarpus is a depressant of the vaso-motor centre, and a stimulant of the peripheral terminations of nerves supplying glands and involuntary muscular fibre, subsequently paralyzing the latter. It is therefore a powerful diaphoretic and sialogogue, a cardiac depressant by stimulation of the vagus ends, also myotic, emetic, and under some circumstances abortifacient. Its taste is hot and pungent. It causes

prompt and profuse perspiration (§ix-xv in quantity), and salivation (§x-xxvij), after a preliminary flushing of the skin. The nasal, bronchial and lachrymal secretions are much increased; sometimes watery diarrhoea occurs; the action of the heart, at first increased, is afterward lowered, the arterial tension is reduced, and the temperature falls from 1° to 4° . Drowsiness, pallor, chilliness and debility succeed, and last several hours; the pupil is contracted and accommodation impaired. The elimination of the urea is relatively increased, but not the quantity of urine. The respiratory power is lowered, and apnoea may occur, from increase of the bronchial mucus.

Pilocarpus is rapidly diffused, and is eliminated by the skin and the salivary glands. Its effects pass off usually in from 3 to 6 hours. Children are less affected than adults, by proportionate doses. It causes contractions of the bladder, uterus and spleen, in the latter case whether the organ is enlarged or of normal size.

Antagonists.—*Atropine* is a complete physiological antagonist in dose of gr. $\frac{1}{100}$ for gr. $\frac{1}{6}$ of Pilocarpine. The antagonism extends over their whole range of action, and is the most complete known to physiological experimentation. Conversely, the same is true, but *Jaborine* acts similarly to *Atropine*, and is antagonistic to Pilocarpine. *Strychnine*, though from a member of the same family, antagonizes the effects on the respiration, and *Morphine* controls the nausea and vomiting. Artificial respiration, to maintain life until elimination occurs, and repeated evacuation of the bladder, are important measures in poisoning by this drug.

Therapeutics.—Pilocarpus is well used in:

Ptyalism, a minute dose of Pilocarpine (gr. $\frac{1}{80}$) acting on the same gland will antagonize the morbid action and relieve the excessive secretion (Bartholow, Piffard). **Perspiration** of profuse character is checked by gr. $\frac{1}{20}$ of Pilocarpine given thrice daily (Ringer). Its action here is to normalize depressed functions.

Amblyopia from alcohol and tobacco, keratitis, choroiditis, chronic iritis, detached retina, and many other eye affections, Pilocarpus is very beneficial; also used as a mydriatic.

Pleuritis, **Meningitis** and other inflammations of serous membranes, it is sometimes efficient in removing exudations.

Dropsy is its chief field of action, especially renal dropsy; but it is contraindicated when the heart is weak from any cause.

Diabetes Insipidus, it reduces the quantity of urine remarkably, relieving

the kidneys by throwing the work on the skin, but this, of course, is palliative, not curative.

Agalactia, *Pilocarpus* promptly stimulates the secretion of milk (?). *Uræmia* and *Puerperal Eclampsia* of renal origin, it has been used with marked success. *Parotitis* is promptly relieved by it (?).

Bright's Disease, *Pilocarpine* has been used with advantage in both the acute and chronic forms, but is so depressing that it must be employed with extreme caution in this disorder.

ANTIZYMOTICS AND ANTIPYRETICS

Antizymotic Drugs are those which arrest the fermentative processes (see *ante*, page 22), including the Antiseptics and the Disinfectants. Many of these agents are also endowed with other qualities of great therapeutical value, due indirectly to their power over ferments; such being Antipyretic and Antiperiodic, as well as Antiseptic. [See also page 21.] The agents which stand at the head of this group are the *Cinchona* alkaloids, the chief of which is Quinine.

CINCHONA—Peruvian Bark

Official Species of *Cinchona* are two, viz.:

Cinchona, the bark of *Cinchona Calisaya*, *C. officinalis*, and of hybrids of these and other species of *Cinchona* (nat. ord. Rubiaceæ), yielding not less than 5 per cent. of total alkaloids.

Cinchona Rubra, Red *Cinchona*, the bark of *Cinchona Succirubra* or of its hybrids, containing not less than 5 per cent. of alkaloids.

Composition of *Cinchona*.—It contains 4 chief alkaloids and 17 others, also 2 simple acids, 2 tannic acids, a resinoid, and coloring matter, as follows:

ALKALOIDS, 4

Quinina, Quinine, the most valuable.

Quinidina, Quinidine, the strongest antiperiodic, but it exists in very small quantity.

Cinchonina, Cinchonine, the least valuable.

Cinchonidina, Cinchonidine, $\frac{1}{2}$ the strength of Quinine.

ACIDS, 4

Kinic. Kino-tannic.

Kinovic. Kinovo-tannic.

OTHER CONSTITUENTS

Kinovin, a resinoid.

Cinchona Red.

Chinoidin, Quinetum, and Quinquina.—*Chinoidin* is the black, bitter residue left after the crystallizable alkaloids have been removed from the

mother-liquor, and it evaporated. It contains the four alkaloids in amorphous condition, and has about one-fourth the strength of Quinine. *Quinetum* (also called Quinquina) is an impure preparation, much used in India. It contains all the alkaloids, the woody fibre being removed, and is about half as strong as Quinine.

Quinina, Quinine, $C_{20}H_{24}N_2O_2 + 2H_2O$, a white, amorphous or minutely crystalline powder, of alkaline reaction and very bitter taste, soluble in 1670 of water and in 0.6 of alcohol at 59°F. and readily in dilute acids. It is fluorescent in solution, is a strong base, and is the most valuable of the Cinchona alkaloids. It is rarely used in its uncombined form, the salts being much more soluble. Dose, gr. j-xv [av. gr. iv], up to gr. xl in special cases.

Preparations of Cinchona.

Fluidextractum Cinchonæ, Flex. of C. Dose, ℥x-xxx [av. ℥xv].

Tinctura Cinchonæ, Tincture of Cinchona. Dose, ʒss-ij [av. ʒj].

Tinctura Cinchonæ Composita, Compound Tincture of Cinchona, has of Red Cinchona 10 per cent., with *Serpentaria* 2, and Bitter Orange Peel 8. Dose, ʒss-ij [av. ʒj].

Salts of the Cinchona Alkaloids.—The chief ones are:

Quinina Sulphas, Quinine Sulphate, soluble in 740 of water, more so in acidulated water. Dose, gr. j-xx, or more [av. gr. jss].

Quinina Bisulphas, Quinine Bisulphate, soluble in 9 of water. Dose, gr. j-xx or more [av. gr. jss].

Quinine Hydrochloridum, Quinine Hydrochloride, soluble in 34 of water. Dose, gr. j-xx or more [av. gr. jss].

Quinina et Ureæ Hydrochloridum, Quinine Carbamide Hydrochloride, a compound salt of quinine and urea, soluble in an equal part of water, and well adapted for hypodermic use in 50 per cent. solution. It is almost unirritating to the tissues, though it delays healing. Dose, gr. j-iiij or more, hypodermically.

Quinina Hydrobromidum, Quinine Hydrobromide, soluble in 54 of water. Dose, gr. j-xx [av. gr. jss].

Quinina Salicylas, Quinine Salicylate, soluble in 77 of water. Dose, gr. j-xx [av. gr. jss].

Cinchonina Sulphas, Cinchonine Sulphate, soluble in 66 of water. Dose, gr. j-xx or more [av. gr. ijss].

Cinchonidina Sulphas, Cinchonidine Sulphate, soluble in 70 of water. Dose, gr. j-xx or more [av. gr. ijss].

Unofficial Derivatives and Preparations.

- **Aristochin*, Diquinine Carbonic Acid Ester, contains of quinine 96 per cent. Dose, gr. viij-xv; gr. j-v for children.
- **Euchinin*, Quinine Carbonic Ether, is claimed to have no unpleasant gastric effects. Dose, gr. v-xx, or more.
- **Saloquinin*, Quinine Salicylic Ester, is tasteless, and free from cerebral effects. Dose, gr. v-xx or more.
- **Chinoidinum*, Chinoidin, is a mixture of cinchona alkaloids, with one-half the power of Quinine. Dose, gr. v-xxx or more.
- **Quinquina*, Quinquinine, Chinetum, contains the total alkaloids extracted by acidulated water. Dose, gr. v-xxx.

Substitutes for Quinine

The synthetical production of Quinine has been the "philosopher's stone" of the modern chemists, who have prosecuted with untiring energy the search for an artificial product possessing all its properties. In this search they have discovered several organic bodies, which closely resemble each other and also quinine, both in chemical constitution and physiological action. These substances belong to the aromatic series of carbon compounds, all of which are derivatives of *Benzene* (*Benzol*), C_6H_6 , the Hydride of the organic radicle *Phenyl*, C_6H_5 . The distinctive action of the lower members of this series is their *antiseptic* and *antipyretic* powers, so that of the fatty series of carbon compounds is *stimulant* and *anæsthetic* (Brunton). Many of these agents are obtained from coal-tar oil (petroleum) by fractional distillation, etc., they are all derivatives of Benzene either directly or from some of the products formed therefrom by substitution, various radicles replacing the different constituent atoms of H and C. Thus *Phenol* (Carbolic Acid), C_6H_5OH , is theoretically derived from Benzene by replacing H by OH (hydroxyl). *Benzoic Acid* by replacing H by CO.OH (carboxyl); while others are formed by uniting two benzenes as in *Naphthalene*, $C_{10}H_8$, or by uniting benzene with another radicle, as *Chinolin*, C_8H_7N , formed by the union of benzene and pyridine. Derived from Chinolin is the hypothetical base *Chinicin*, $C_8H_7N_2$, which is represented in Antipyrine.

Physiological Action.—Cinchona is an astringent bitter tonic, and antiseptic, antiperiodic, antipyretic and antimiasmatic, a diminisher of reflex action, a protoplasmic poison, and an oxytocic. Its action in suffi-

cient dose is that of its chief alkaloid Quinine, which is rapidly diffused and slowly excreted, being found in the urine in one-fourth of an hour after administration, and for 3 days afterward. At first it promotes appetite, digestion, the flow of saliva and of gastric juice; but long-continued it sets up a gastric catarrh, impedes digestion and causes constipation. It arrests the movements of the white blood corpuscles, and decreases their number; and prevents acetification and decay of the blood. *The Heart* and arterial tension are slightly stimulated by small doses, but depressed by large ones (gr. xl-lxx), which slow and enfeeble the pulse, the drug acting directly on the cardiac ganglia. *The Brain* is irritated by small doses, large ones causing anæmia, pallor, a sense of fullness and constriction in the head, singing in the ears, vertigo, a staggering gait, amaurosis and deafness (though the eyes and ears are rarely ever injured seriously), great headache, coma, dilated pupils, delirium, and in animals convulsions. These symptoms collectively are termed "Cinchonism." *The Reflex Function* of the cord is lowered considerably by large doses. *The Spleen* is reduced in size, and the temperature of pyrexia lowered, though it does not depress the body temperature in health. In some subjects it causes mental excitement, in others cutaneous eruptions followed by desquamation; it lessens the excretion of uric acid, but not that of urea; and is a uterine stimulant in labor. Its power to initiate uterine contractions is still a much debated question.

Antagonists.—As to its cerebral action *Morphine* is antagonistic; *Belladonna* or *Atropine* to its nervous, cardiac, and antipyretic powers.

Therapeutics.—The principal use of Quinine is in the malarial diseases, over which its influence is that of a specific. In:

Intermittents, gr. x of Quinine Sulphate in the sweating stage and again 2 hours before the expected time of the next paroxysm. *Arsenic* in the intervals, in lieu of Quinine, which may cause a daily exacerbation of temperature if long continued.

Remittent Fever, gr. xx-xxx of Quinine Sulphate once or twice a day, until the temperature is reduced to the normal point.

Pernicious Fevers, large doses of Quinine Sulphate, gr. xxx-lx, are necessary to safety.

Chronic Malarial Poisoning, Chinoidin is more effective than Quinine (?).

Prophylactic, against malaria, Quinine, gr. ij-ij *per diem* is effective.

Inflammations, at their inception, may be aborted by Quinine, gr. xv-xx, combined with Morphine, which here is synergistic to it (?).

Acute Tonsillitis may sometimes be aborted by Quinine in full dose (?).
Acute Catarrh may often be aborted by Quinine, gr. x, Morphine, gr. $\frac{1}{4}$ (?).
Surgical Fever, and before surgical operations, Quinine was much used.
Neuralgia, of the ophthalmic div. of the 5th, and when due to malaria.
Skin Diseases, especially erythema nodosum, and erysipelas (?).
Uterine Inertia, gr. viij of Quinine Sulphate, followed by gr. iv after an hour, to increase the expulsive action of the uterus (?).
Asiatic Cholera was treated by Quinine, from 1831 to 1873, as an inhibitory agent on the spirilla.
Amæbic Dysentery, Quinine Sulphate in solution, 1 in 3000, by high intestinal irrigation, has proved very efficient.
As a Tonic, Quinine Sulphate in small doses (gr. j-ij), or the Compound Tincture of Cinchona with a mineral acid, has many applications, as in atonic dyspepsia, gastric catarrh of drunkards, adynamic states, convalescence, asthma, chronic bronchitis, insanity, and generally in weak subjects of flabby flesh and perspiring skin.
 "Some patients have a marked idiosyncrasy for quinine, doses of one grain producing distressing and alarming symptoms."

ANTIPYRINA—Antipyrine

Source and Composition.—Antipyrine is a synthetical base, which forms salts analogous to those of Ammonium, and is a product obtained from phenyl-hydrazine. Its chemical name is *Phenyl-dimethyl-pyrazolon*, $C_{11}H_{11}N_2O$, and in the Brit. Phar. its title is PHENAZONUM, Phenazone.

Characteristics.—It occurs as a whitish, crystalline powder, which combines with acids to form salts, is somewhat bitter, and soluble in one-half its weight of hot water, and in its own weight of cold water; but is still more so if the water is acidulated with dilute nitro-hydrochloric acid. It is less soluble in alcohol, chloroform or ether, gives an intensely *red* color with Ferric Chloride, and a beautiful *green* with Nitrous Acid. It is not irritant to either the stomach or ordinarily to the tissues, and may be administered hypodermically. Dose, gr. j-x [av. gr. iv]. The Brit. Phar. gives the dose at gr. vx-x.

Antipyrine has but little flavor, is not unpleasant, and is therefore readily taken by children, in which respect it is greatly superior to quinine. It may be administered in compressed tablets, each having 3, 5 or 10 grains.

Preparations.—The only important salt is:

**Antipyrinæ Salicylas*, Antipyrine Salicylate (Salipyrin), formed by combining Salicylic Acid 57.7 and Antipyrine 42.3; a white, crystalline, odorless powder, very soluble in alcohol, insoluble in water. Its claims to preference are based upon its comparative harmlessness (3ijss having been taken within 3 or 4 hours without ill effect); also its freedom from unpleasant after-results. Dose, gr. v–xx every hour or 2 hours until 3ij have been taken.

Incompatibles are very numerous. It may be decomposed when brought into contact with Nitrous compounds, a new and poisonous substance being supposed to be formed, of uncertain composition, but resembling the Anilin greens. The mixture of this drug with Spiritus Ætheris Nitrosi is therefore highly dangerous if this supposed reaction is at all likely to occur.

Analogue of Antipyrine

***Chinolinum**, Chinolin, C_9H_7N , is a constituent of coal tar, but may be obtained from Quinine or Cinchonine by destructive distillation, or prepared artificially from Anilin or Nitrobenzol. It is a powerful antiseptic and antipyretic, closely resembling Quinine in its action, but of very disagreeable taste and odor. In moderate doses it lowers the pulse-rate and reduces the body-temperature; in large ones it diminishes reflex excitability, and causes dyspnoea, paralysis and collapse. It has been used in typhoid fever, acute rheumatism and erysipelas, also in typhus, diphtheria, etc., with varying success. In the latter disease, a 5 per cent. solution in weak alcohol is painted over the affected surface. The Tartrate has been used with asserted benefit in neuralgia and whooping-cough, and as an antiperiodic in intermittents. Dose of the Tartrate, gr. v–xx, in aqueous solution.

***Orexin**, *Phenyl-dihydro-chinasolin*, is a complex chinolin derivative, and occurs as a yellowish powder, insoluble in water, but soluble in dilute hydrochloric acid and in the gastric juice. It is incompatible with preparations of Iron. The Hydrochloride and the Tannate are used, the latter being the favorite preparation. Dose, gr. ij–viij, twice daily, before meals, followed by a draught of warm water or beef-tea, as a stomachic tonic, and for anorexia.

***Thallinum**, Thallin (Parachinanisols), has the chemical name *Tetrahydro-paramethyl-oxychinolin*, and is a synthetically prepared substance,

occurring as a colorless powder, soluble in water, and forming salts with acids, of which the Sulphate is the most eligible. It is an antipyretic of very great power, but induces profuse sweating and a dangerous degree of depression. Dose, gr. ij-x, in tablets; a mean average dose being about gr. v.

Physiological Action.—Antipyrine is a powerful antipyretic, a local anæsthetic and a general analgesic, and also possesses diaphoretic, mydriatic, antiseptic, disinfectant and slightly hypnotic powers. After the ingestion of a full medicinal dose (gr. xx-xxx), there is a stimulant stage of short duration, in which the heart's action is increased, and a subjective sense of heat is experienced, with cyanosis of the face. This is soon followed by profuse sweating, coldness of the surface, slowed pulse, considerable depression, and if fever be present by *lowered temperature*; the latter coming on within half an hour after taking the drug and its degree being in direct ratio to the quantity administered, as also its continuance, the former being usually from 3° to 5°, and the latter from 1 to 10 hours, a fair average being about 2 hours. In one case a fall of 12°F. was observed. After the antipyretic effect of the dose has passed off, the temperature (in fever) commences to rise again, the onset being usually preceded by a chill, which is of slight degree when compared with the severe rigors and dangerous depression occurring under the action of Kairin, Chinolin, and other members of the group.

In health its administration gives rise to slight nausea, singing in the ears, and a reduction of the body-temperature of scarcely any extent, about $\frac{1}{10}$ °F. It slightly raises the arterial tension and blood-pressure; sometimes (but seldom) induces vomiting, also a peculiar eruption on the skin; and (very rarely) such a degree of depression as to amount to collapse. It has no effect upon the respiration, but acts as a sedative upon the cerebrum, leaving behind a somewhat depressant influence on the brain. It dilates the pupils and is eliminated by the kidneys, appearing in the urine some 3 hours after its ingestion. The profuse sweating which it causes may be prevented by giving in advance a small dose of Atropine or Agaricine.

In toxic dose Antipyrine probably acts as a primary stimulant and a secondary depressant of the spinal cord, paralyzes both the motor and sensory nerve trunks, decreases the arterial tension, and exerts a poisonous influence on the blood, altering the shape of the red corpuscles, separating the hæmatin, and causing decomposition of that tissue. A peculiar livid discoloration of the surface is one of the most characteristic symptoms of a

antipyrine poisoning, and is probably due to the formation in the blood of methæmoglobin or some similar compound.

As an antipyretic, Antipyrine, like alcohol, acts by a double mode of operation, by diminishing oxidation, and by promoting heat-loss. The latter is attained by dilating the cutaneous vessels, allowing free radiation from the surface, and by the refrigerant action due to evaporation of the sweat. As an analgesic it has considerable power, in common with the chinolin derivatives; the assumption is that it blocks the sensations of pain in the region of the thalamus. In general anodyne action, it is not to be compared with the derivatives of opium. It depresses the heart by direct action on the cardiac muscle. It is rapidly absorbed, and is eliminated within 24 to 30 hours after administration.

The members of the Chinolin series of compounds destroy life either by exhaustive convulsions or gradual paralysis of the respiratory centre, the lower ones acting chiefly on the sensory centres of the brain and reflex centres of the cord, destroying voluntary and reflex movement; while the higher ones act principally on the motor centres, first as irritants, causing violent convulsions, and afterward producing paralysis (Brunton).

Therapeutics.—One of the most popular of the modern antipyretics, Antipyrine is one of the most certain depressants of pyrexia, though somewhat dangerous, and at the same time being devoid of any other influence upon the course of any febrile disorder. Its principal applications are as follows, viz.:

In Hyperpyrexia from any cause, it is efficient, but somewhat dangerous.

Acute Rheumatism, it has held the first place as a remedy, for sometime; but it acts as an analgesic solely, having no curative power.

Neuralgia, Neuritis, and other painful affections, especially when of rheumatic origin, as lumbago, sciatica, hemicrania, supra-orbital neuralgia, etc., in which 10-grain doses are generally sufficient, and may be given hypodermically. But beware of idiosyncrasies.

Painful Affections of hysterical persons; pain from cerebral tumors and from cardiac diseases; also painful menstruation; all of which are promptly relieved by it in most cases, especially when used with Morphine.

Influenza, Salipyrin was extensively employed during the epidemic of 1891, and was highly extolled for its efficient action therein, as also for its freedom from cardiac disturbance.

Acute and Chronic Gout, Antipyrine has been remarkably successful, as an analgesic.

Chorea, and other affections due to excitability of the motor centres, as pertussis and epilepsy, Antipyrine is esteemed by some.

As a *Local Anæsthetic*, applied to mucous membranes in 30 to 50 per cent. solution, it is efficient, but much inferior to Cocaine.

Epistaxis, and other hemorrhages, in 25 per cent. solution as a spray, it is an effective local hæmostatic, constricting the small vessels without forming a clot which may break down.

ACETANILIDUM—Acetanilide

Source and Composition.—Like the major number of the newest antipyretics, which are related either to Chinolin or to Phenol, Acetanilide is a derivative of Anilin, from which it is obtained by the action of glacial acetic acid, substituting the organic radicle Phenyl for an atom of hydrogen. Chemically, it has the name *Phenyl-acetamide*, and the formula C_6H_5NO . Its trade name *Antifebrin* is copyrighted and should be dropped from professional usage.

Characteristics.—Acetanilide occurs in colorless, inodorous glistening, lamellar crystals, soluble in 200 of water, and in 4 of alcohol. Dose, gr. j-ijj (B. P.); average dose, gr. iv (U. S. P.). Death has occurred from 5 grains, and recovery has taken place after ingestion of a drachm. As an antipyretic gr. iij of Acetanilide may be repeated every half hour until the temperature falls, the patient being watched for cyanosis or *symptoms of collapse*. As an analgesic, gr. vij of Acetanilide will usually be sufficient in cases to which the drug is applicable.

Preparations and Compounds.—One was official, viz.:

**Pulvis Acetanilidi Compositus*, Compound Acetanilide Powder, has of Acetanilide 70, Caffeine 10, Sodium Bicarbonate 20. Dose, gr. v-x [av. gr. vijss].

**Many Unofficial Preparations* are sold as headache powders, containing Acetanilide or Acetphenetidin in various proportions, and designated by trade names; as Ammonol, Antikamnia, Antikol, Antinervin, Exodyne, Febrinol, Phenatol, Phenolid, Pyretine, Salphene, etc.

Analogues of Acetanilide

Acetphenetidinum, Acetphenetidin (Phenacetin), $C_{10}H_{11}O_2$, is a phenol derivative (acetparaphenetidin), the product of the acetylation of para-

amidophenetol. It occurs in white, glistening, crystalline scales, or fine, crystalline powder, odorless and tasteless, soluble in 70 parts of boiling water, in 12 of alcohol, nearly insoluble in water. It is the safest of the new synthetical antipyretics, reducing pyrexia gradually, and causing perspiration, without producing collapse. It is also anodyne and hypnotic, soothing pain and producing sleep. Dose, gr. v-x [av. gr. vjss], in powder, tablets or cachets, hourly or every two hours, but larger doses, gr. xv-xx, are frequently administered for analgesis, up to a maximum of 3j in 24 hours.

***Lactophenin**, *Lactyl-para-phenetidin*, is another phenetidin derivative containing a lactic acid constituent instead of the acetic acid one of phenacetin. Its action is antipyretic, analgesic, and hypnotic, and it has been recommended as a substitute for phenacetin on account of its greater solubility. It has been used with especial benefit in abdominal typhus (Jacksch); also in acute rheumatism, chorea and locomotor ataxia (Von Roth). Dose, gr. viij-xv or more, up to 3jss daily, in wafers.

***Phenocoll Hydrochloride** is another synthetical antipyretic, closely allied to Phenacetin, both chemically and medicinally, and distinguished by its comparatively free solubility, gr. xv dissolving readily in 3j of water. It has decided power as an antipyretic, antirheumatic and analgesic, with the decided advantage that it has no injurious effect upon the blood corpuscles, even when in direct contact with them. Dose, gr. v-xx, an average dose being about gr. xij, three or four times a day.

Physiological Action.—Acetanilide is a very efficient antipyretic, besides being strongly analgesic and antispasmodic, lessening the reflex action of the spinal cord, and inhibiting the sensibility of sensory nerves. It raises the arterial tension somewhat, and slows the heart in a corresponding degree.

Compared with the action of Antipyrine the effect of Acetanilide on the body-temperature is manifested more slowly (1 hour against $\frac{1}{2}$ hour), but lasts a longer time (6 against 2 hours). It is markedly diuretic, somewhat diaphoretic; is a cerebral, muscular and vaso-motor stimulant, and leaves no ill after-effects; while Antipyrine is powerfully diaphoretic, a cerebral sedative, and produces great depression. Furthermore, Acetanilide produces the same degree of reduction of body-temperature as Antipyrine, with the ingestion of but one-fourth the dose; and, like the latter agent, it has little or no effect on the normal temperature, and its continued use begets tolerance of its action. Its antipyretic action corre-

sponds, in degree and in duration, to the size of the dose, the pulse is slowed, and quiet sleep often follows. There is neither vomiting nor diarrhoea afterward, but there is a tendency to collapse, with chills and cyanosis, especially the latter, during the period of depressed temperature. A toxic dose destroys the ozonizing function of the blood, forming methyl-hæmoglobin. The heart, liver and kidneys are found in a state of acute fatty degeneration, in animals poisoned thereby.

Therapeutics.—Besides being one of the more efficient antipyretics, Acetanilide has marked analgesic and antispasmodic powers; and these, together with its great advantages of a small dose, efficiency and relative safety, and the absence of the severe rigors which mark the chinolin derivatives, combine to make it one of a wide therapeutical range. It is especially useful in:

Pains of Locomotor Ataxia, and in those of rheumatic origin, sciatica, lumbago, etc., it is a most efficient remedy.

Acute Rheumatism, it is highly praised; though its efficiency is herein disputed by Salol, also by Salipyrin.

Epilepsy, it is being tried, with a view of moderating reflex excitability.

Epidemic Influenza, both as a prophylactic and a remedy, Acetphenetidin has proved highly efficient.

Migraine has been treated with benefit by Acetphenetidin in 2-grain doses with gr. ss of Citrated Caffeine.

Acetphenetidin is the least dangerous of the coal-tar antipyretics and should be preferred. They all should be used as analgesics only, never as antipyretics, cool bathing being equally efficient and devoid of all danger.

PHENOL—Carbolic Acid

Phenol, C_6H_5OH , is hydroxy-benzene, obtained either from coal tar or made synthetically. Its claims to be considered an acid are very feeble, as, though it has a faint acid reaction and combines with salifiable bases, it is incapable of neutralizing alkalis, and its combinations are decomposed by the feeblest acids, sometimes even by water. Considered as the hydroxyl derivative of Benzene, it might be classed with the alcohols, but as it does not yield the same products on oxidation (yielding finally oxalic instead of acetic acid), it is taken as the type of a class called *Phenols*, which are simple hydroxyl (HO) derivatives of the aromatic hydrocarbons. Dose, gr. $\frac{1}{4}$ –ij [av. gr. j], well diluted.

Characteristics.—Peculiarities about Phenol are that the addition of about 8 per cent. of water liquefies it, a further addition of water produces a turbid mixture, until about 15 of water are added, when a stable and clear solution is formed. One volume of the liquefied acid, containing 8 per cent. of water, forms with one volume of Glycerin a clear mixture, which is not rendered turbid by the addition of three volumes of water (absence of Cresote and Cresol). Phenol coagulates albumin or collodion (Creosote does not), and by the addition of nitric acid it is converted into Picric Acid, etc. (Creosote into Oxalic Acid).

Preparations.—The following are official, viz:

Phenol, Carbolic Acid, hydroxybenzene obtained from coal tar. Average dose, gr. j.

Phenol Liquefactum, Liquefied Phenol, has 86.4 of absolute Phenol, and about 13.6 per cent. of water. Dose, ℥ss-ij [av. ℥j].

Glyceritum Phenolis, Glycerite of Phenol, has of the preceding 20, in Glycerin 80. Dose, ℥iij-x [av. ℥v].

Unguentum Phenolis, Ointment of Phenol, has of Phenol 3 per cent. in White Petrolatum.

Phenylis Salicylas, Phenyl Salicylate or Salol, the phenyl ester of salicylic acid. Av. dose, gr. v.

Derivatives.—Two are official, viz:

Sodii Phenolsulphonas, Sodium Phenolsulphonate (Sodium Sulphocarboxylate), soluble in 5 of water. Dose, gr. ij-x [av. gr. iv].

Zinci Phenolsulphonas, Zinc Phenolsulphonate, soluble in 2 of water. Dose, gr. j-v [av. gr. ij].

**Phenol-camphor* has equal parts of Phenol and Camphor, insoluble in water or in glycerin, and used as a local anæsthetic, chiefly for toothache; also in the proportion of Phenol 1, Camphor 3, as an application to the false membrane of diphtheria, and as subcutaneous and intrapulmonary injections in diphtheria.

Analogues of Phenol

Creosotum, Cresote, is a mixture of phenols, chiefly Guaiacol and Creosol, obtained during the distillation of wood-tar, preferably of that derived from the beech. Dose, ℥j-v [av. ℥iv].

A colorless or yellowish, oily liquid, of strongly empyreumatic odor, burning and caustic taste, and neutral reaction; freely soluble in alcohol, ether, acetic acid, etc.,

sparingly in water (1 in 150), more readily in boiling water. It does not coagulate albumin or collodion (difference from Phenol, which does). By the action of nitric acid it is converted into Oxalic Acid chiefly (Phenol into Picric Acid, etc.).

Creosoti Carbonas, Creosote Carbonate, a mixture of the carbonates of creosote and guaiacol. Av. dose, gr. xv.

Aqua Creosoti, Creosote Water, strength 1 per cent. is the only official preparation. Dose, ʒj-ʒiv [av. ʒij].

Guaiacol, Guaiacol (Methyl Pyrocatechin), is the most active ingredient of Creosote, of which it constitutes from 60 to 90 per cent. Occurs as a colorless, inflammable liquid, soluble in alcohol. Dose, ℥v-xv [av. ℥viij].

Guaiacolis Carbonas, Guaiacol Carbonate (Duotal), insoluble in water. Dose, gr. v-xx [av. gr. xv] or more, gradually increased to a maximum of ʒjss daily.

**Thiocol*, Potassium Guaiacol Sulphonate, is said to contain 60 per cent. of Guaiacol. Dose, gr. viij-xxx, up to ʒjss or even ʒiv daily; in diarrhoea, pneumonia, and tuberculosis. It is readily soluble in water, and may be used hypodermically.

Resorcinol, *Meta-dihydroxy-benzene* ($C_6H_4(OH)_2$), is a diatomic phenol, and one of the three isomeric substances formed by substituting two atoms of hydroxyl for two of hydrogen in Benzene, as the substitution of one produces Phenol; the other two being Pyrocatechol and Hydroquinone. Resorcinol occurs in colorless, rhombic prisms or plates of neutral reaction, soluble in water, also in alcohol, ether, etc. Dose, gr. j-v [av. gr. ij]; as an antipyretic gr. v every 2 hours, or gr. xv-xxx at one dose, not repeated.

* *Hydroquinone* occurs in plates of sweetish taste, and is about four times stronger than Resorcinol, having the same action and uses.

* *Pyrocatechin* also occurs in plates or crystals, is three times stronger than Resorcinol, but otherwise the same; is readily soluble in water, alcohol and ether.

Pyrogallol, *Pyrogallic Acid*, $C_6H_3(OH)_3$, is a triatomic phenol obtained chiefly by the dry distillation of gallic acid. It has the same form of composition as the preceding substances, except in it 3 atoms of Hydroxyl are substituted for 3 of Hydrogen in the Benzene-ring, instead of 1 as in Phenol, and 2 as in Resorcinol. It occurs in light, glistening crystals, which are readily soluble in water and in alcohol, and combine rapidly with oxygen, becoming of a dark color. Dose, gr. ss to jss.

Physiological Action.—Phenol is antiseptic and antiferment, also a deodorizer and disinfectant, being very destructive to low forms of life

when used in sufficient strength. It prevents the decomposition of albuminous fluids by bacteria, the fermentation of sugar by yeast, the conversion of starch into sugar, of albumin into peptones, and the decomposition of amygdalin with formation of hydrocyanic acid. As ordinarily used in weak solutions its action upon low organisms is inhibitive rather than destructive, its safe solutions being only sufficient to prevent their development. Locally, it is styptic, anæsthetic and superficially escharotic, coagulating the albumin of the part, and the blood also when outside the body. It is powerfully poisonous to the tissues, and when applied directly to muscle or nerve, it paralyzes them at once without previous stimulation.

When swallowed undiluted, Phenol produces violent gastro-enteritis, with vomiting and purging, followed by collapse, delirium, and often by convulsions and death. After absorption it acts by selection upon the medulla, especially on the respiratory and vaso-motor centres therein, which it first briefly stimulates and then completely paralyzes. It stimulates the cardiac inhibition, first slowing the heart, then depressing and finally paralyzing it. Respiration, at first increased, is soon depressed, the pupils are contracted, and the brain and spinal cord are directly affected, stupor, coma, suspended reflexes, impaired motility and sensibility being produced. It is rapidly absorbed and diffused, many fatal cases having occurred from its local use in full strength. It is one of the most rapid poisons known, sometimes equalling Hydrocyanic Acid in this respect. The minimum fatal dose is not determined, but $\frac{3}{4}$ ss has frequently caused death, and $\frac{1}{2}$ vj have given rise to dangerous symptoms. It is partly oxidized in the body, and partly eliminated by the lungs and kidneys, imparting to the urine a smoky appearance. Death from a medium dose occurs by paralysis of respiration, from a large dose by paralysis of the heart. The blood, after death, is very dark in color, and is almost non-coagulable.

Guaiacol internally has similar action to that of Phenol. Locally applied it is powerfully anæsthetic and antipyretic.

Creosote has similar properties, but is not so actively toxic as Phenol; it causes increased coagulability of the blood, and does not produce convulsions. It is largely eliminated by the kidneys, though formerly thought to be excreted by the bronchial mucosa. In small doses it seems to have anæsthetic influence on the terminal nerve-filaments in the gastric mucous membrane. It explodes when combined with Oxide of Silver in pills unless previously diluted with an inert powder.

Resorcinol is not irritant to the skin or the submucous tissue, and but slightly so to mucous membranes. It is antiseptic and antiferment, arresting decomposition and destroying low organisms. 3ss to 3j causes a sense of heat, discomfort and oppression, followed by profuse perspiration and languor; if fever has existed the temperature is lowered several degrees, but rises again after a rigor, in from 2 to 4 hours.

Pyrogallie Acid is exceedingly poisonous, the symptoms coming on in rapid succession, with headache, vomiting and purging, collapse, etc. It decomposes the red blood-corpuscles, causing thrombi in the venous radicles, hemorrhagic infarcts in the kidneys, and hæmaturia, also melanæmic discolouration of the skin and mucous membranes. Its antiseptic action is doubtful.

Antidotes and Antagonists.—Any soluble sulphate is a chemical antidote, forming a phenolsulphonate, but active on unabsorbed phenol only. *Magnesium Sulphate* used in one case (nearly 3 ounces), where half an ounce of 95 per cent. acid had been swallowed, with full recovery from an all but hopeless condition of collapse. *Alcohol* used by washing out the stomach with a diluted alcohol, 10 per cent., is a much used antidote, but it should be removed by further washings through the stomach tube. *Atropine* is said to be a very complete physiological antagonist, maintaining the heart, and respiration until elimination occurs, which should be promoted by diluents, used freely. *Vegetable Demulcents* (but no oils or glycerin) to protect the mucous surfaces.

Therapeutics.—Phenol owes its past prominence to its having been the principal agent used in Lister's Antiseptic Method; but its use in that connection has become greatly restricted, many surgeons having abandoned it altogether in favor of other germicides. Locally, it has many uses, relieving *pruritis* of almost any form if applied in a 5 per cent. solution over the itching surface, and making an excellent gargle (1 per cent.) for the painful *sore throat* of diphtheria, tonsillitis, etc. Internally, it is no longer used or recommended. It may be advantageously administered in dilute solution (2 to 5 per cent.) by spray, in many chronic pulmonary affections; also locally:

Catarrhs, acute and chronic. *Erysipelas*.

Parasitic Skin Diseases. *Abscesses*.

Uterine and other *Ulcers*.

Exanthematous Fevers, and other Septic diseases, Sodium Phenolsul-

phonate internally in 5-grain doses every 2 or 3 hours; has been much praised by many practitioners.

Creosote is more suitable for internal administration and has been extensively used in phthisis, but today there is a wide and healthful scepticism concerning its value, hygienic measures having proved of far more benefit. Being a very complex substance of varying composition, Creosote is being supplanted by Guaiacol, its principal ingredient, for internal administration, especially in *pulmonary tuberculosis*. Guaiacol painted on the skin is used as an antipyretic in the *hyperpyrexia* of many diseases, and similarly applied to a particular part as a local anæsthetic in *orchitis*, *epididymitis*, *sciatica*, *odontalgia*, and other painful affections.

Resorcinol has been used as a local antiseptic in *diphtheria*, cystitis, facial erysipelas and syphilitic sores; but it has fallen into almost complete disuse having been supplanted by less dangerous remedies.

Pyrogallol is employed locally in skin diseases, a 20 per cent. ointment being used as a caustic in lupus, cancer and chancres. It is said to destroy the diseased tissue without affecting the healthy tissue in the vicinity (Brunton). A 10 per cent. ointment is applied in psoriasis, lupus erythematosus, etc., but the dangers of absorption must be borne in mind, and it must be used on small areas.

SALICIN AND SALICYLATES

Salicinum, Salicin, $C_{13}H_{18}O_7$, is a glucoside obtained from several species of *Salix* (willow) and *Populus* (poplar), also found in *Gaultheria procumbens* (wintergreen) and in *Betula lenta* (sweet birch), the volatile oils of which consist almost entirely of methyl salicylate. It occurs in white, silky, crystalline needles; soluble in 24 of water and in 89 of alcohol. Dose, gr. x-xxx [av. gr. xv].

Acidum Salicylicum, Salicylic Acid, $HC_7H_5O_3$, is an organic acid, existing in various plants, but most largely prepared synthetically from phenol. It occurs in fine, prismatic needles or a crystalline powder; soluble in about 460 of water and in $2\frac{1}{2}$ of alcohol, but readily soluble in water containing 8 per cent. of borax or 10 of sodium phosphate. Dose, gr. v-xv [av. gr. xij].

Salicylic Acid is a derivative of Salicin, probably by double oxidation; but may also be considered as a substitution-derivative of Benzene, formed by replacing 2 atoms of its hydrogen, the one by hydroxyl, and the other by carboxyl (see page 184). It is obtained therefore, either synthetically by combining the elements of Phenol

with those of CO_2 , and subsequent purification, or from natural Salicylates as the oils of wintergreen and sweet birch, or from Salicin, by heating with caustic potash and treating with hydrochloric acid. The acid prepared from natural sources is purer and more efficient than that made artificially, and will often be tolerated by a patient who cannot bear the latter.

Salts and Derivatives.—The chief ones are:

Sodii Salicylas, Sodium Salicylate, soluble in 1 of water and in 9 of alcohol, also in glycerin. Dose, gr. v-xxx [av. gr. xv].

Lithii Salicylas, Lithium Salicylate, very soluble in water and in alcohol. Dose, gr. v-xxx [av. gr. xv].

Phenylis Salicylas, Phenyl Salicylate (Salol), is the phenyl ester of salicylic acid, and when warmed with an alkali it splits up into Salicylic Acid 60, and Phenol 40. Dose, gr. v-xv [av. gr. vss] in tablets or cachets, or in emulsion.

Methylis Salicylas, Methyl Salicylate, produced synthetically, or obtained by distillation from *Gaultheria procumbens*, or from *Betula lenta*. The label must indicate the origin. Average dose, ℥xij.

**Aspirin*, Acetyl-salicylic Acid, is soluble in 100 of water. "It is said to be" more efficient than the salicylates, and to cause less gastric irritation, but has no advantages. Dose, gr. v-xv, thrice daily.

Physiological Action.—Salicylin is a bitter tonic, an antipyretic, anti-ferment, and antiseptic, being destructive to low organisms. It prevents the reaction between amygdalin and emulsin, and that of ptyalin on starch. It seems to be devoid of toxic power on man, and is probably excreted as Salicylic and Salicyluric acids. It has some slight power as an anti-periodic.

Salicylic Acid has properties similar to the above, but acts with greater energy. In small doses it irritates the stomach, heart and respiration, but large doses derange the stomach, causing nausea and vomiting, depress the heart and respiration, lower the arterial tension, and reduce the temperature in fever. It causes vertigo, dilated pupils, tinnitus aurium, a sensation of tension in the frontal cerebrum, delirium, and occasionally collapse, from sudden depression of the circulation. A lethal dose produces death by paralysis of the respiration. During its administration bed-sores are frequently observed, due to the depressed state of the circulation which it induces. During its excretion it often irritates the kidneys and causes albuminuria. It colors the urine green by transmitted and brown by reflected light, and under its use the urine contains a substance which reduces copper solution. It is destructive to the torula, prevents alcoholic

fermentation and that caused by the organic ferments (pepsin, ptyalin, etc.). In solutions containing bacteria it will prevent their development, if in the proportion of one per cent., and in that of 1 in 60 it will destroy them though in full activity.

Sodium Salicylate is remarkably antipyretic in doses of gr. xv, given 4 to 5 times in 24 hours. It is a powerful diaphoretic, and is supposed to possess the curious property of increasing the fluidity of the bile, other cholagogues increasing the proportion of solids therein (Brunton). It has no antiseptic power unless with a strong mineral acid to liberate the salicylic acid.

Salol is antiseptic, antipyretic and germicide, in a higher degree than either of its constituents. As an antipyretic in fever it stands next after Antipyrine, and it acts with such force as to frequently depress the temperature a degree or two below normal. It is sedative to the cerebro-spinal system, and somewhat analgesic. It causes profuse sweating, and in a few cases considerable depression has accompanied its antipyretic employment; it may prove toxic from the split-off phenol. Dosage, ranges from 5 to 30 grains, up to 2 or 3 drachms in the 24 hours.

Therapeutics.—Salicin and its derivatives are chiefly used in *Acute Rheumatism*, to lower temperature, relieve pain, and reduce articular swelling. They are most suitable to strong, vigorous patients, and if not promptly efficient they should be abandoned. Salicylic Acid is much used as an antipyretic in fevers, especially those of the septicæmic kind. It is a useful local application to *Corns* and *Warts*, also in:

Eczema of hands and feet. *Cancer*. *Gangrenous Wounds*.

Fetid Perspirations, in which it is used in solution with Borax.

Sodium Salicylate is employed instead of the acid in acute and chronic *rheumatism*, to relieve *headaches*, and for *phlegmasia alba*, in which it is considered very efficient, also in cases where there is a tendency to the formation of *gall-stones*.

Salol is a remedy used for *duodenal catarrh*, catarrh of the bile-ducts and catarrhal jaundice; also in the *bilious* form of *sick-headache*, and in some forms of *neuralgia*, but much doubt exists as to its value in these conditions. Its greatest power is manifested over *acute rheumatism*, in which disease many clinicians maintain that it has no superior, if given in 15- to 30-grain doses, up to 2 drachms in the 24 hours, and continued for some time after the acute symptoms have subsided; but the urine must be carefully watched for evidences of carbolic poisoning.

METHYLENE BLUE

Methylthioninæ Chloridum, Methylthionine Chloride (Methylene Blue), $C_{12}H_{12}N_2SCl$, a derivative of Anilin, occurs as a dark green, crystalline powder, or as prismatic crystals of bronze-like lustre; readily soluble in water, less so in alcohol, the solutions having a deep blue color. Dose, gr. j-vj [av. gr. iv], up to gr. xx daily, with gr. ij of powdered nutmeg given with each dose to prevent strangury.

Physiological Action and Therapeutics.—Methylene Blue should not be confounded with Methyl Blue, the dye, which is highly poisonous. It manifests a strong affinity for nerve tissue, and is the best staining agent for the malaria plasmodium. It destroys the plasma of this organism, and is curative in the forms of *malaria* showing the crescents and full-grown parasites, while quinine is more efficient when the nuclei are more developed than the plasma (Ehrlich). Its best action in malarial affections has been obtained in children, and being tasteless it may be administered to them more easily than quinine, besides being free from the vomiting and headache which so frequently result from the latter drug. It has been employed in *chronic cystitis* and *diabetes mellitus*, and has given satisfaction in several very obstinate cases of *arthritis deformans* (?). It is rapidly eliminated by the kidneys, and imparts a blue color to the urine. Methylene blue formerly had considerable vogue, especially for its effect (psychic ?) in gonorrhœa; but the therapeutic claims for the drug have not been substantiated, and it is rapidly falling into merited oblivion as a medicine.

NAPHTHALENUM—Naphthalene

Source and Composition.—Naphthalene, $C_{10}H_8$, is a hydrocarbon product formed during the manufacture of ordinary coal gas. Chemically, it is one of the benzene derivatives, being formed by the union of two benzene groups in an overlapping ring. When redistilled it crystallizes in colorless, rhombic plates, of tarry odor, and burning, aromatic taste, insoluble in water, dilute acids or alkalies, and but sparingly so in alcohol. Dose, gr. j-iiij [av. gr. ij], in emulsion, or as a powder with sugar in wafers or capsules.

Derivatives of Naphthalene.

Beta-Naphthol, Naphtol, is a phenol occurring in coal tar, but usually prepared from Naphthalene. It is soluble in alcohol, ether, oils, etc.,

and is chiefly used as ointment, 1 to 5 for adults, but for children not over 1 in 50. Dose, gr. iiij-x [av. gr. iv].

**Hydronaphthol*, glistening, micaceous scales, sparingly soluble in water, freely soluble in alcohol, oils, etc. Used as an antiseptic, and in ointment or powder locally, diluted with oxide of zinc, 1 to 50. Dose, gr. j-iiij or more, in pills coated with Keratin or Salol.

**Bensonaphthol* is prepared from beta-naphthol by the action of benzoyl chloride, and occurs as a tasteless powder, insoluble in water. Dose, gr. v-xv, as an intestinal antiseptic and disinfectant in typhoid fever and tropical dysentery.

**Naphthol Camphoratum*, Camphorated Naphthol, is prepared by heating carefully 1 part of beta-naphthol with 2 of camphor; the product being a homogeneous, oily fluid, which is insoluble in water, and decomposes readily on exposure to light and air. Used as a parenchymatous injection, the undiluted fluid being well borne, or in Olive oil, in doses of Mij-v.

Physiological Action.—*Naphthalene* is destructive to all forms of low life, and hence is antiseptic in a high degree, but must be intimately mixed with the substances upon which it is to act. Internally it is an irritant to mucosa; and tends to produce retinal degeneration, erythrocytosis, acute nephritis, strangury and cystitis. Kidney irritation has resulted from external applications. *Beta-Naphthol* is more easily absorbed, and may cause vomiting, hæmaturia, convulsions, and unconsciousness. *Hydronaphthol* is a powerful and non-irritating antiseptic, non-poisonous, non-corrosive, freely soluble in alcohol, glycerin, fixed oils, etc., in cold water, 1 to 2000; and in hot water 1 to 100, precipitating as the water cools, but leaving a saturated solution of 1 to 1000, which is perfectly inhibitive of the germs of putrefaction in all putrescible fluids (Levis).

Therapeutics.—*Naphthalene* has been used as an "intestinal antiseptic" especially in typhoid and dysentery, but its value in these cases is more than doubtful. Locally, it has high value as an antiseptic, for indolent ulcers, sloughing wounds, open cancers, pus cavities, etc. Painted over organic remains it effectually prevents the ravages of insects.

Beta-naphthol is used in the form of a 2 per cent. soap in prurigo, herpes, ichthyosis and favus, also in a $\frac{1}{2}$ to 5 per cent. alcoholic solution, or as a 10 per cent. ointment, for hyperidrosis, scabies, and eczema, but it is a dangerous and irritant application. Internally it has been employed in typhoid fever, dilatation of the stomach, intestinal dyspepsia, diarrhoea,

and dysentery, but its value as an internal antiseptic may well be questioned, as the use of antiseptics internally is a practice at present *sub judice*. *Hydronaphthol* is highly esteemed for antiseptic purposes generally, by those who have used it, and is of benefit as an external application in many skin diseases. Its non-toxic and non-irritant qualities render it one of the most useful and most generally available of the group.

Camphorated Naphthol has been employed for the irrigation of joints, bony cavities, tendinous sheaths, cold abscesses, in the pleural and uterine cavities, and in tuberculosis of the bladder, all these localities seeming to tolerate the undiluted fluid well. In tuberculous adenitis and tuberculosis of the testis, it has been used hypodermically in several cases with gratifying results; but the experimental data in all these cases is as yet too limited for rational conclusions.

BENZOIN, BENZOIC ACID

Benzoinum, Benzoin, is a balsamic resin obtained from *Styrax Benzoïn*, a Siamese tree (nat. ord. *Styracæ*). It occurs in agglutinated tears, or a brownish mass, of little taste, but agreeable odor, soluble in alcohol and solution of potassa; and consists of *Benzoic Acid*, 10 to 20 per cent., together with *Resins* 80 per cent., and a trace of a volatile oil. Dose, gr. v-xx [av. gr. xv].

Acidum Benzoicum, Benzoic Acid, $\text{HC}_7\text{H}_5\text{O}_2$, occurs in light, feathery plates and needles, and is obtained from Benzoin by sublimation. Soluble in 2 of alcohol, and in 500 of water, but with Borax, 1 part of each are soluble in 100 of water. Dose, gr. v-x [av. gr. vijss].

Preparations, including the salts of Benzoic Acid, or Benzoates.

Adeps Benzoïnatus, Benzoinated Lard, has of Benzoin 2 per cent.

Tinctura Benzoini, Tinct. of B., 20 per cent. Dose, ℥v-xx [av. ℥xv].

Tinctura Benzoini Composita, Compound Tincture of Benzoin (Friar's Balsam), has of Benzoin 10, Aloes 2, Storax 8, Balsam of Tolu 4, and Alcohol to 100 parts. Dose, ℥x-xl [av. ℥xxx], but it is generally used locally.

Ammonii Benzoas, Ammonium Benzoate, soluble in 5 of water, and in 28 of alcohol. Dose, gr. v-xxx [av. gr. xv].

**Lithii Benzoas*, Lithium Benzoate, soluble in 4 of water, and in 12 of alcohol. Dose, gr. v-xxx [av. gr. xv].

Sodii Benzoas, Sodium Benzoate, soluble in about 2 of water, and in 45 of alcohol. Dose, gr. v-xxx [av. gr. xv].

Physiological Action.—The action of Benzoin is due to Benzoic Acid, which is stimulant and irritant to mucous membranes and raw surfaces, also highly antiseptic [a stimulating expectorant], and a diuretic, also antipyretic, analgesic and diaphoretic. A solution of 1 in 1000 prevents the development of bacteria, and one of 4 in 1000 is fatal to most of them. Taken internally it causes epigastric heat, increases the pulse-rate, from direct action and stimulates the respiratory centre and the bronchial mucous membrane. It acidifies the urine, and increases its quantity, and is chiefly excreted by the kidneys, in part unchanged, and partly as hippuric acid after uniting with glyccoll. Benzoin acts as an irritant to the mucous membrane of the fauces and nasal passages, its powder inhaled causing sneezing and coughing.

Therapeutics.—The uses of Benzoin and Benzoic Acid are chiefly local, but they may be used with benefit internally in several affections of the respiratory and urinary passages. In:

Chronic Bronchitis of the aged, and in:

Laryngeal and *Bronchial* affections, Benzoin by steam atomization.

Scabies and *Parasitic Skin Diseases*, Benzoin in ointment.

Chaps and *Sore Nipples*, the compound tincture 1, to 4 of glycerin and water.

Wounds of foul character, the tinctures are excellent applications.

Cystitis with alkaline urine and phosphatic deposits, Benzoic Acid or its salts are extremely valuable, being one of the certain means of neutralizing morbid alkalinity of the urine.

Phosphatic Calculi, a long course of Ammonium Benzoate.

Phthisis and *Whooping-cough*, the Sodium salt is for inhalation by an atomizer.

ACIDUM BORICUM—Boric Acid

Boric Acid (*Boracic Acid*), H_3BO_3 , is a weak acid, occurring in transparent, colorless, six-sided plates, of unctuous touch, odorless, of a cooling and slightly bitter taste, soluble in 25 of water, in 15 of alcohol and in 10 of glycerin. Its aqueous solubility is increased by the addition of hydrochloric acid or borax. It is produced from Borax by the action of sulphuric acid; also by the purification of the native acid. Dose, gr. v–xv [av. gr. viijss].

Salt and Preparations.

Sodii Boras, Sodium Borate (Borax), soluble in 15 of water, insoluble in alcohol. Dose, gr. v–xxx [av. gr. xij].

Glyceritum Boroglycerini, Glycerite of Boroglycerin, is prepared by heating together Boric Acid 310 and Glycerin 460, until reduced to 500, then adding an equal weight of glycerin.

Liquor Antisepticus, Antiseptic Solution, Boric Acid 2, Benzoic Acid 0.1, Thymol 0.1, Eucalyptol, 0.025, Oil of Peppermint 0.05, Oil of Gaultheria 0.025, Oil of Thyme 0.01, Alcohol 25, Purified Talc 2, Water to 100. Dose, 3ss-ij [av. 3j]. The proprietary preparation named *Listerine* is similar to this.

Unguentum Acidi Borici, Ointment of Boric Acid, strength 10 per cent. in Paraffin 5, and White Petrolatum 85.

Physiological Action.—Boric Acid is feebly germicidal, but in dilute solution (1 in 143) it is antiseptic and stimulant, and has a soothing effect on mucous membranes. In concentrated form it is decidedly irritant. Its physiological action is feeble, but poisonous doses have caused lowered temperature, depressed spirits, a feeble pulse, and an erythematous eruption with swelling, followed by exfoliation, and especially affecting the lower extremities.

Sodium Borate has considerable antiseptic power, but is inefficient as a germicide. It aids the solution of boric and benzoic acids, and increases the contractile power of the uterus when given internally. When administered in large doses it produces certain toxic symptoms to which the term *Borism* is applied. These include intestinal disturbance, nausea, vomiting and anorexia, also dryness of the skin, with redness and even inflammation of the mucous membranes. There is great general weakness, the hair is dry and falls out, and a cutaneous eruption occurs, which may assume the forms of seborrheic eczema, reddish patches which desquamate like psoriasis, or papules attended with much itching. In severe cases albumin may appear in the urine, and œdema of the face and extremities may occur. It is quite probable that some of these reactions would occur as a result of the long-continued use of foods preserved with borax or boracic acid.

Therapeutics.—Boric Acid is a favorite antiseptic. It is used as a dusting powder, also in lotion and ointment. In:

Skin Diseases, as ulcers, eczema, burns, scalds, pruritus ani, fetid perspirations and tinea, the ointment is an effective remedy.

Conjunctivitis, solutions of gr. x-xx to the ʒ are used advantageously.

Erysipelas of phlegmonous type, a saturated solution is highly recommended as a local application. Ichthyol is far better.

Cystitis, a saturated solution as a vesical wash, also internally when the urine is ammoniacal.

Pruritus, Borax in solution for urticaria, psoriasis, impetigo, and pruritus of the anus, scrotum, etc.

Acne, Freckles, etc., Borax in solution as a sedative lotion.

CHLORINE, CHLORIDES

Chlorum, *Chlorine*, Cl, is a greenish-yellow gas, belonging to the *Halogen* group of elements; and though not official itself is represented in medicine by several of its compounds, as well as by certain preparations which furnish it.

The so-called *Halogen Elements* derive their title from two words meaning salt-producing; they are largely obtained as follows: *Chlorine*, from sea-salt and rock-salt; *Bromine*, from sea-water, and *Iodine*, from seaweed. They are all noted for their affinity for hydrogen, and consequent power as decomposers of organic matter.

Chlorine Compounds, described under the titles of their respective metallic bases, are the *Chlorates* of Potassium and Sodium; the *Chlorides* of Ammonium, Calcium, Potassium, Mercury, Gold, Iron and Zinc, etc.; also *Hydrochloric Acid*, classed with the mineral acids (see page 44), and Chloral, Butyl-chloral, Ethyl Chloride, and Chloroform (see pages 104, 108 and 110).

Sodii Chloridum, *Sodium Chloride (Common Salt)*, NaCl, is soluble in about 3 of water, insoluble in alcohol. Dose, gr. x-3j [av. as an emetic 3iv].

Preparations containing Chlorine.

**Liquor Chlori Compositus*, Compound Solution of Chlorine (Chlorine Water), is an aqueous solution containing about 0.4 per cent. of chlorine, with some oxides of chlorine and potassium chloride. It should be freshly prepared. Dose, ℥xx-3ij [av. 3j] in water; as a lotion or spray 3j-iv, well diluted.

Calx Chlorinata, Chlorinated Lime (often improperly called Chloride of Lime), contains not less than 30 per cent. of available chlorine. Dose, gr. iij-vj [av. gr. iv] in water; for external use a 1 to 3 per cent. solution.

Liquor Sodæ Chlorinata, Solution of Chlorinated Soda (Labarraque's Solution), is an aqueous solution of several chlorine compounds of sodium, and contains at least 2.5 per cent. of available chlorine. Dose, ℥x-xxx [av. ℥xv] in 20 parts of water.

Physiological Action.—In the presence of moisture Chlorine is one of the most powerful of disinfectants and deodorants, also an antiseptic and antifermentative agent of the highest activity; its power in these respects being due to its affinity for hydrogen, decomposing all bodies which contain hydrogen as a molecular constituent, forming hydrochloric acid and setting oxygen free in its nascent form (ozone). Administered internally, it is converted, on reaching the stomach, into hydrochloric acid and chlorides, losing all action on the organism in its own character. Locally applied, it is irritant to the skin and mucous membranes, producing a sense of heat, with burning sensations and even vesication. Inhaled in any quantity, it causes cough, choking, and spasm of the glottis, also inflammation of the mucous lining of the air passages and the lungs. Ten parts in a million may be fatal.

The Chlorides generally resemble in action their metallic constituents rather than Chlorine; but one of them possesses qualities of its own which render it of prime importance, namely *Sodium Chloride*, or Common Salt. This substance is one of the most important and abundant of the saline constituents of the animal organism, existing normally in the blood where it maintains the normal osmotic pressure and acts as a relaxant to the cardiac muscle tissue during diastole. In very dilute solution it enables water to dissolve both albumins and globulins, and renders water non-irritant to the animal tissues and harmless to the red blood-corpuscles. For these purposes the solution employed is one of 0.85 per cent., known in experimental physiology as the "normal salt solution." In substance, however, or in concentrated solution, it is very irritant to cut surfaces, mucous membranes, muscle and nerve tissues. Taken into the stomach in quantity it irritates that organ, and induces vomiting; and, when absorbed in excess of the normal requirements of the body, it causes, in great intensity, the peculiar nervous irritation which is expressed by the sense of *thirst*; and this is only relieved by the ingestion of water in sufficient quantity to enable the excess to be dissolved and excreted by the kidneys. It is rapidly absorbed, and equally rapidly excreted; and, when consumed in excess, it increases tissue-change, and consequently the excretion of urea, and also the excretion of potassium salts. On the other hand, the excessive ingestion of potassium salts (as in the cases of herbivorous animals and vegetarian addicts), increases the excretion of sodium chloride, by a double decomposition between them in the blood, forming potassium chloride and sodium phosphate, which, being foreign to the blood, are constantly excreted. In this way, by a continuous vegetable diet, the

normal amount of sodium chloride in the organism may be greatly reduced; and the animal will feel the want of it, and will travel hundreds of miles to visit a salt-lick. Besides being emetic, when given internally, Sodium Chloride also acts as a hæmostatic, decreases the secretion of mucus, is a vermifuge against ascarides, promotes the absorption of pleuritic serous exudations and of dropsies, and has considerable power as an antiperiodic and an antiseptic.

Antidotes.—*Albumen* if Chlorine preparations have been taken into the stomach; also a little *Aqua Ammonia* sufficiently diluted, may be given with advantage.

Therapeutics.—The Chlorinated preparations are used as disinfectants and deodorizers of rooms, drains, and discharges from the body; but rarely about the person or clothing, as they are too irritant to be inhaled with impunity, and they destroy the color of fabrics. In very dilute solution they are employed with great benefit as local applications in:

Diphtheria and other septic diseases, to destroy fetor chiefly.

Gangrenous Ulcers and wounds, foul discharges, etc., as deodorizers.

Bites of serpents and insects, a strong solution of Chlorinated Soda.

Silver Nitrate Poisoning, Sodium Chloride as an antidote.

Hemorrhage and *Shock* may frequently be satisfactorily combated by the free use of normal salt solution (or better still, Ringer's Solution) administered subcutaneously, *per rectum*, or, in grave emergencies, intravenously.

Ascarides Sodium Chloride, in solution by enema, two tablespoonfuls of the salt to a pint of water, will effectually destroy them.

THYMOL AND MENTHOL

Thymol, $C_{10}H_{14}O$, is a phenol contained in Oil of Thyme and in the volatile oils of several other plants. It occurs in large, hexagonal crystals of aromatic odor; soluble in 1200 of water and in 1 of alcohol, freely in fats and oils. It liquefies when triturated with about equal quantities of camphor, menthol or hydrated chloral. Dose of Thymol, internally gr. ss–gr. iij [av. gr. ij] as an antiseptic; 15 grains daily as an anthelmintic; as a spray 1 part in 800 of hot water; as an ointment, gr. v–xxx to the ℥ of petrolatum; as inhalation, gr. vj to ℥j of warm water.

Menthol, Peppermint Camphor, $C_{10}H_{18}OH$, is a secondary alcohol obtained from Oil of Peppermint by deposit on exposure to cold. It

occurs in colorless crystals or masses, having the taste and smell of peppermint oil, soluble in alcohol, ether, etc., but sparingly in water. It forms an oily liquid when rubbed up with an equal quantity of thymol, pure phenol, or hydrated chloral, or one-half of croton-chloral, or two-thirds of camphor. Dose, gr. ss-ij [av. gr. j] in pill or alcoholic solution, several times a day.

Mints and their Preparations

Mentha Piperita, *Pepper-mint*, the leaves and tops of *Mentha piperita*, a plant of the ord. Labiatae, cultivated everywhere.

Oleum Mentha Piperita, Oil of Peppermint, is the volatile oil distilled from the fresh herb, consisting of Menthol (see above), and a liquid terpene. Dose, ℥j-v [av. ℥ij].

Aqua Mentha Piperita, Peppermint Water, 2 per 1000. Dose, ℥iv.

Spiritus Mentha Piperita, Essence of Peppermint, has 10 per cent. of the oil and 1 per cent. of the herb. Dose, ℥x-xlvi [av. ℥xxx].

Mentha Viridis, *Spearmint*, the leaves and tops of *Mentha spicata*, the well-known "mint" of the gardens, a cultivated plant of the ord. Labiatae, having properties and constituents identical with those of Peppermint, but differing therefrom in odor and taste. Its preparations are as follows:

Oleum Mentha Viridis, Oil of Spearmint. Dose, ℥ij-v [av. ℥ij].

Aqua Mentha Viridis, Spearmint Water. Dose, ℥ij-vj [av. ℥iv].

Spiritus Mentha Viridis, Essence of Spearmint. Dose, ℥x-xlvi [av. ℥xxx].

Physiological Action.—*The Mints* are aromatic stimulants, carminatives and antispasmodics, their oils possessing these qualities in greater degree, and also local anodynes and anæsthetics, especially if their evaporation be prevented after their application to a surface. The Chinese oil is especially efficient as an anodyne, and contains a large quantity of Menthol.

Menthol acts as a local vascular stimulant when applied to the skin; and also a local anæsthetic, but not corrosive, causing first a sensation of burning, which is replaced by a feeling of coldness when the part is blown upon. It is a powerful antiseptic, the Oil of Peppermint being found to destroy comma bacilli in solution of 1 to 2000; but its slight solubility in water prevents its use becoming general in this respect. Administered internally it stimulates the secretory nerves and the cardiac muscles, and causes a periodic increase in arterial tension (like camphor), but does

not effect the pulse-rate. It decreases the respiratory rate, and increases the depth of the respirations. It lessens sensation and reflex sensibility, in large doses destroying both, and paralyzing the cerebro-spinal system.

Thymol resembles both Phenol and Oil of Turpentine in its action, being a powerful antiseptic and germicide, like the former, and like the latter an irritant to the organs of elimination and a paralyzant. When absorbed in toxic quantity it paralyzes the nerve-centres in the spinal cord and medulla from the first, with no preliminary stimulation; slowing respiration, lowering the arterial tension, blood-pressure and body-temperature, and lessening reflex excitability. It is eliminated by the urinary and respiratory organs, which it irritates during its excretion. Autopsies on animals poisoned by it show fatty degeneration of the liver (as with phosphorus), and great congestion of the bronchial and pulmonary mucous membranes and of the kidneys. However, it is very slowly absorbed in the absence of oils and fats.

Therapeutics.—The *Oils of the Mints* are employed chiefly as carminatives and stimulants, to relieve flatulence and colic; also as corrigents to purgatives, to lessen griping. *Menthol* is used locally as an antiseptic and analgesic, and *Thymol* as an antiseptic application to wounds and skin diseases, as a spray or inhalation in chronic affections of the lungs and bronchi, and as an anthelmintic against the ankylostomum duodenale.

Insects, as mosquitoes, gnats, etc., are effectually repelled by the odor of the oils of mint, and attracted by that of thyme.

Neuralgia, *Odontalgia*, etc., are sometimes relieved by the application of the menthol pencil over the surface, or the oily liquid resulting from its trituration with chloral, camphor, etc., on cotton in the cavity of a carious tooth.

Rhinitis and *Pharyngitis* are sometimes treated with sprays of Menthol in some bland oil.

Ankylostomiasis (*Uncinariasis*) is effectually treated by Thymol, in 3 or 4 doses of gr. x-xxx, in capsules; care being taken that no alcoholic drink or oils or fats of any kind are taken, lest the drug be absorbed and cause thymol poisoning.

ANTISEPTIC OILS

Oleum Caryophylli, *Oil of Cloves*, Contains the *Light and Heavy Oils of Cloves*, the latter containing *Eugenol* a phenol, and *Caryophyllin* a camphor. Dose, Mj-v [av. Mij].

***Oleum Gaultheriæ**, *Oil of Wintergreen*, consists of *Methyl Salicylate* 90 per cent., and *Gaultherilene* a hydro-carbon, 10 per cent. Dose, ℥v-xxx [av. ℥xv]

Oleum Cajuputi, *Oil of Cajuput*, a volatile oil distilled from the leaves of *Melaleuca Leucadendron*, nat. ord. Myrtaceæ. It should yield 55 per cent. of *Cineol*. Dose, ℥v-x [av. ℥viii].

***Oleum Eucalypti**, *Oil of Eucalyptus* (see page 58), consists of three volatile oils, which distil over at different temperatures, the first being *Eucalyptol* (*Cineol*), an organic oxide. Dose, ℥v-xx [av. ℥vii], in emulsion or capsules.

***Oleum Myrti**, *Oil of Myrtle* (*Myrtol*), is a volatile oil distilled from the leaves of *Myrtus communis*, the Myrtle (nat. ord. Myrtaceæ). It is a mixture of *Pinene* and *Cineol*. Dose, ℥j-iiij, in capsules.

Oleum Thymi, *Oil of Thyme*, is distilled from the leaves of *Thymus vulgaris*, nat. ord. Labiatæ; and consists of two portions, the more volatile being a mixture of the hydrocarbons *Cymene* and *Thymene*, the less volatile being chiefly *Thymol* (see page 207). Dose, ℥j-v [av. ℥iiij].

Physiological Action.—The general action of these oils and their derivatives agrees with that of Thymol. *Myrtol* is an active antiseptic and parasiticide, and sufficiently irritant on a raw surface to excite inflammation. It is eliminated by the lungs and kidneys, acting as an antiseptic and stimulant to the mucous membranes at the points of elimination. *Eucalyptol* is one of the most powerful antiseptics, and the *Oil of Eucalyptus* is nearly as efficient, either of them ranking above Quinine in hindering the development of anthrax bacilli (Koch). The latter is a local irritant, and if applied to the skin and its evaporation prevented, it acts as a vesicant or a pustulant. In the stomach it is irritant, doses of 20 minims causing burning sensations and great pain. Absorbed in large quantity it is a powerful poison to the nerve-centres, depressing the spinal cord, brain, medulla, and heart, abolishing reflex action, lowering the blood-pressure and temperature, and causing death by paralysis of respiration. It is excreted by the pulmonary and renal mucous membranes, imparting a smell of violets to the urine, acting as a stimulating expectorant and a renal and urinary antiseptic. It arrests the movements of the white blood corpuscles, causes contraction of the spleen, and has considerable power as an antiperiodic, in all of which qualities it resembles Quinine, though much less efficient.

Therapeutics.—These oils are not as much used in medicine as formerly. The Oil of Cloves is often employed in domestic practice, as a local anæsthetic in toothache and superficial neuralgia. Dissolved in alcohol, any of these oils will promptly correct flatulence, if administered internally, in small doses. Their most important applications are in the following affections, viz.:

Bronchorrhœa, fetid bronchitis, gangrene of the lung, etc., Eucalyptus may be used for inhalations.

Choleraic Vomiting, and that due to nervous derangement, the Oil of Cajuput, with Spt. Chloroformi, and Tinct. Cinnamomi.

Rheumatism, *Gout*, and allied affections, are frequently well treated by Oil of Gaultheria, in emulsion with other similarly acting agents. The effect here is the sedative one common to the salicylates. The Spirits may well be substituted for the Oil.

Uterine Catarrh, Oil of Eucalyptus has been used in an injection, as a local disinfectant and stimulant.

The principal uses of these preparations are for their flavoring properties, for the calminative effects and for their antiseptic virtues.

FORMALDEHYDUM—Formaldehyde

Formaldehyde, *Formic Aldehyde*, *Formyl*, CH_2O , is a gaseous aldehyde obtained by the oxidation of methyl alcohol. It has a low specific gravity, mixes readily with air, and is soluble in water and in alcohol. It does not affect the color or structure of clothing or other fabrics in common use.

Preparations and Derivatives.—The two first are official.

Liquor Formaldehydi, Solution of Formaldehyde (Formalin), is an aqueous solution, containing not less than 37 per cent., by weight, of absolute formaldehyde. It is miscible in all proportions with water and alcohol. One part by volume added to 40 of water makes a 1 per cent. solution of formaldehyde. To prevent polymerization it should be mixed with an equal quantity of a saturated solution of boric acid, or a 2 per cent. solution of borax, or with glycerin.

Hexamethylenamina, Hexamethylenamine (Urotropin), $\text{C}_6\text{H}_{12}\text{N}_4$, is a condensation product obtained by the action of ammonia upon formaldehyde. It occurs in colorless, odorless, crystals, readily soluble in water, and in 10 of alcohol, decomposed by diluted sulphuric acid, liberating formaldehyde. Dose, gr. j-x [av. gr. iv], up to 3j daily, in water or carbonated water.

**Paraform*, $C_3H_4O_2$, is the solid polymeric form of formaldehyde, which it gives off when slowly heated. It occurs as a colorless, crystalline powder, of stable constitution, insoluble in water.

**Glyco-formalin* has of formaldehyde 30, Glycerin 10, Water 60, the glycerin preventing the polymerization of the gas and the consequent formation of paraform.

Physiological Action.—Formaldehyde is a powerful antiseptic and disinfectant, ranking next below Mercuric Chloride as a germicide, and above it in being but slightly toxic to the higher animals. A solution of 1 in 20,000 kills most bacteria if the contact is prolonged, and a 1 per cent. solution destroys all pathogenic spores within an hour. It is probably the most reliable disinfectant for general use, when employed in connection with moist air. It is intensely irritant to mucous membranes, a minute quantity in the atmosphere causing violent irritation of the conjunctivæ and the lining of the respiratory tract, with stinging and prickling in the nose and throat, tears, salivation, and catarrh. In concentrated solution it coagulates albumin and gelatin, and applied to the skin it produces a leathery condition which may pass into a localized necrosis without suppuration, leaving the surface with the appearance of a recently healed wound. It is much too irritant to be generally available as a surgical antiseptic, the application of a 1 per cent. solution to an ulcerated surface causing intense and prolonged pain.

Internally the aqueous solution produces in animals nausea and vomiting, followed by quick respiration, narcosis and coma, and in the rabbit convulsions and opisthotonos. Small doses raise the blood pressure, but a toxic one depresses the circulation, and acts on the blood, changing the form of the cells, and causing immediate coagulation on exposure, with separation of a dark red serum. The injection of 250 c.c. of a 1 in 2000 solution into the arm produced in one case bloody and albuminous urine. It causes less severe symptoms when given hypodermically than when taken by the stomach in the same quantity. Large doses may be injected subcutaneously, and though painful will not give rise to systemic effects. A portion of the absorbed gas passes through the tissues unchanged, and is excreted in the urine.

Hexamethylenamine is decomposed in the organism, formaldehyde being set free and eliminated in the urine. Ordinary medicinal doses cause no general effects as a rule, but in susceptible persons it may cause gastric and renal irritation, with hæmaturia, hæmoglobinuria, and albuminuria, also diarrhoea, abdominal pain, a measly rash, headache, tinnitus aurium,

and strangury. It is an excellent urinary and intestinal antiseptic, and possesses considerable power as a solvent of uric acid, the excretion of which it promotes.

Therapeutics.—As a:

Disinfectant for instruments, furniture, clothing and rooms, Formaldehyde is largely used; the gas being set free by heating the official solution.

Chronic Bronchitis and *Whooping-cough*, the solution diluted with 99 of water, sprayed by a steam-atomizer above the patient's head for 20 minutes thrice daily. Of questionable value.

Cystitis, *Pyelitis*, and *Phosphaturia*, Hexamethylenamine internally, as a urinary disinfectant, is particularly efficient.

Epidemic Meningitis, Hexamethylenamine has been widely recommended as a prophylactic, but not on sufficiently adequate grounds.

OXYGENIUM—Oxygen

Oxygen is now official, though used in medicine less than formerly. It enters into the composition of 13 official oxides, including those with Hydrogen, viz., *Aqua* (Water), H_2O , and *Hydrogen Dioxide*, H_2O_2 ; also most of the acids and their salts, and many organic bases, including most of the alkaloids. It may be obtained pure from many of its combinations, but is usually prepared by heating Manganese Dioxide or Potassium Chlorate, or preferably both together. It is furnished by manufacturing chemists in all large cities, compressed in iron cylinders furnished with a rubber bag and mouthpiece, by which to administer it.

Preparations yielding Oxygen.

Liquor Hydrogenii Dioxidii, Solution of Hydrogen Dioxide, is as lightly acid, aqueous solution of Hydrogen Dioxide, H_2O_2 , containing when freshly prepared about 3 per cent. of the pure dioxide, corresponding to about 10 volumes of available oxygen. It occurs as a colorless liquid, without odor, slightly acidulous, producing a peculiar sensation and soapy froth in the mouth, and liable to deteriorate by age, heat or protracted agitation. Dose, ʒss-ij [av. ʒj], diluted with 3 to 4 parts of water.

**Acetozone*, Benzoyl-acetyl Peroxide, is an unstable compound which undergoes hydrolysis in the presence of water, its solution containing Aceto-peracid (acetyl-hydrogen peroxide) and *Benzo-peracid*, both intensely oxidizing and germicidal bodies. It is marketed in the form

of a powder, one-half of which is infusorial earth acting as a diluent and preservative. By adding gr. xxx of the powder to half a gallon of warm, distilled water, shaking, settling, and decanting, the solution is obtained, and this is administered internally in doses of $\mathfrak{J}\text{iv}$, up to $\frac{1}{2}$ gallon in 24 hours. Not usable after 36 hours. Dose of the powder, gr. iij-v, diluted with sugar or milk, and dispensed in capsule.

Physiological Action.—*Oxygen* is essential to respiration, blood formation, nutrition and tissue-change, in fact to life itself. Applied to the unbroken skin it has no apparent effect, but when applied to a wounded tissue it increases the circulation therein and acts as a stimulant. Inhaled in the pure state (not as air) it causes very little constitutional disturbance. A slight sense of heat is felt in the mouth and may extend along the larynx, trachea and bronchi. The pulse is usually quickened, but it may be lessened in frequency, the appetite is increased, the temperature is slightly raised and the cardiac action is stimulated; a sense of mental exhilaration and a disposition to greater bodily activity may be produced, but no constant influence on the excretions has been noticed. In some persons it seems to cause nervous symptoms similar to those produced by nitrous oxide gas.

Hydrogen Dioxide, in fresh solution, is one of the most powerful oxidizing agents known, by reason of the facility with which it parts with oxygen to oxidizable substances brought in contact with it. It is consequently a powerful yet non-toxic antiseptic, destroying morbid products and organized ferments to which it is applied. In contact with a suppurating surface it generates a white foam, as the result of its action on the pus. This soon subsides, leaving the subjacent tissue cleansed of morbid secretions. One part added to 1000 of water containing sewage or infectious microbes is sufficient to destroy the various organisms if allowed to act thereon for 24 hours.

Acetozone is not toxic to the human organism, and yet it is a powerful germicide. A solution of 1 in 100,000 will kill cholera germs within five minutes and typhoid germs in less than fifteen; while one of 1 in 3000 destroys all pathogenic organisms within a minute, and their spores after a longer time (Novy). It is not available as an antiseptic, on account of its proneness to break up in the presence of organic substances. Thrown into boiling water it liberates oxygen and is actively deodorant in the atmosphere of a room; having been successively used in this manner to destroy the odor of malignant variola.

Therapeutics.—Oxygen itself is chiefly used by inhalation in diseases of the respiratory apparatus, in asphyxia, and affections characterized by defective oxidation; but its utility is questioned.

Dyspnoea of emphysema, asthma, bronchial dilatation, phthisis, etc., the inhalation of oxygen is beneficial.

Asphyxia from toxic gases, or due to opium and chloroform narcosis, it is an effective remedy.

Uræmic Coma, it has been used with benefit.

Gout and Diabetes, its inhalation gives good results (?).

Ulcers, Sores, Foul Wounds, etc., the Hydrogen Dioxide solution is an efficient local application.

Diphtheria, Quinsy, and other morbid conditions of the throat and nasal passages, the Hydrogen Dioxide solution diluted as a gargle or spray is efficient, though not without danger to the Eustachian tubes.

Typhoid Fever, Dysentery, and Cholera, Acetozone has been very effective as an intestinal germicide, but awaits further study.

Gonorrhœa, especially of females, Acetozone has been used locally with satisfaction.

BENZOSULPHINIDE—Saccharin

Benzosulphinidum, Benzosulphinide (Saccharin), is officially described as the anhydride of ortho-sulphamide-benzoic acid (benzoyl sulphonimide). It is a sweet imide, derived from the toluene of coal-tar; and occurs as a white, crystalline powder, having an intensely sweet taste, even in dilute solutions; soluble in 250 of water, and in 25 of alcohol at 77°F., in 24 of boiling water, readily soluble in ammonia water, in alkali hydroxide solutions, and in a solution of sodium bicarbonate with evolution of CO₂. Dose, gr. ss-v [av. gr. iij].

Physiological Action and Therapeutics.—Benzosulphinide is an efficient sweetener and only slightly injurious to man. Taken internally it is rapidly absorbed and is eliminated unchanged chiefly by the kidneys. Its most remarkable quality is its sweet taste, which is 500 times more intense than that of sugar when pure, but the commercial article is standardized to about 300 times the sweetening power of sugar. Acids in foods greatly reduce its sweetening power. In

Diabetes Mellitus, and subjects of hepatic disease and corpulence, it is an efficient substitute for sugar.

Saccharin was accidentally discovered by Dr. Fahlberg, in the Johns Hopkins Laboratory of Chemistry.

SPECIFICS

Specifics are agents which possess a selective curative influence, each on a particular disease (see page 37). The true specifics are the various Animal Extracts and Sera, the most important of which are the Thyroid and Suprarenal Glands, and Anti-diphtheric Serum or Diphtheria Antitoxin, these being official; but many other animal extracts and sera are used in medicine.

ANIMAL EXTRACTS

Thyroideum Siccum, Desiccated Thyroid Glands, are the thyroid glands of food animals, freed from fat, cleaned, dried, and powdered. Dose, gr. jss.

Suprarenalum Siccum, Desiccated Suprarenal Glands, are the suprarenal glands of food animals, freed from fat, cleaned, dried, and powdered. Dose, gr. iij-vj [av. gr. iv]. For local use 4 to 50 per cent. sterile aqueous solutions of a glycerin extract are applied as a spray, or by a swab or brush.

Preparations and Derivatives.

**Thyroid Extract*, gr. j equals gr. x of the crude gland. Dose, gr. ss thrice daily, gradually increased to gr. v.

**Epinephrine* is a principle obtained from the suprarenal gland, the Chloride of which is marketed in a 1 to 1000 solution, which may be still further diluted for local medication. Dose, Mv-x of the solution every 4 hours.

Physiological Action.—A large dose of *Thyroid Extract* may give rise to constitutional symptoms, and several cases are recorded in which it has caused death. Nausea, vomiting, neuralgic pains in the back and limbs, cardiac irritability and weakness even to syncope, slight pyrexia, dyspnoea, progressive emaciation, headache, diarrhoea, nervousness, tremor, pruritus, and insomnia, are the principal manifestations of *thyroidismus* produced by its excessive use. It powerfully stimulates metabolism and elimination, increases largely the secretion of urine and the excretion of urea and other urinary constituents, and acts as a specific vaso-dilator, thus inducing perspiration and lowered blood-pressure. In one case all the symptoms of diabetes developed under its continuous administration for psoriasis. In another instance a typical attack of gout came on, but subsided when the extract was stopped, and reappeared when it was again administered.

The secretion of the *Suprarenal Glands* strongly stimulates involuntary

muscle by direct action, especially affecting the vaso-motor apparatus and the cardiac muscle, causing contraction of the arterioles and an extraordinary rise of blood-pressure, followed by slowing and strengthening of the heart's action through the vagus and the cardiac motor ganglia. These effects are of short duration and are produced by a very small quantity, the one-tenth of a grain of the dried gland causing a maximal result on the heart and arteries in a dog of 20 pounds weight. The rise of blood-pressure is greater than that produced by any other known substance. Locally, the extract is a powerful constrictor of the blood-vessels.

Epinephrine manifests the properties of the suprarenal gland in greater concentration, being the most powerful hæmostatic and astringent known, and a cardiac stimulant of great energy. It is claimed to be 600 to 1000 times more powerful than the extract, the $\frac{1}{200,000}$ of a gramme ($\frac{1}{13,000}$ of a grain), administered intravenously, producing a distinct effect upon the adult man; and the fraction of a drop of a solution of 1 in 10,000 blanching the normal conjunctiva within 30 to 60 seconds. Its intravenous administration acts powerfully on the muscular system, especially the muscle of the heart and blood-vessels, causing an enormous rise of blood-pressure. It is non-irritant, non-toxic, non-cumulative, devoid of injurious properties, and has little or no effect upon the cerebrum. It has no anæsthetic power in itself, but when used in connection with cocaine, novocaine, etc., it prolongs the duration of the anæsthesia produced by them.

Therapeutics.—Thyroid Gland is specific against:

Myxædema, which is due to thyroid absence or inadequacy, and is curable by thyroid feeding, or by the administration of the extract.

Cretinism, also a thyroid disease, is greatly ameliorated and even cured by the prolonged use of the thyroid gland or its extract.

Psoriasis, and some other skin diseases, have been successfully treated with thyroid extract, in some cases.

Obesity is markedly reduced by thyroid feeding. But this is usually a dangerous procedure.

Hæmorrhage, if superficial, is promptly checked by Suprarenal Gland internally and locally, or by Epinephrine solution, acting as a vaso-constrictor.

Addison's Disease, when not cancerous or tuberculous, has been ameliorated by Suprarenal Extract, but in only a few cases.

Collapse and Cardiac Failure, Epinephrine as a powerful stimulant of the heart and vaso-motor system.

Other Animal Extracts are: *Orchitic Extract*, used as an assumed tonic; *Brain Extract*, for locomotor ataxia, neurasthænia, anæmia, etc.; *Bone Marrow Extract*, for pernicious anæmia, hæmophilia, and chlorosis; *Splenic Extract*, for exophthalmos, typhoid fever, and disorders of the blood; also *Thymus Extract*, *Pancreatic Extract*, and others; all of which applications are highly empirical.

SERA—Serums

Serum-therapy proper is the prophylactic and curative treatment of certain infectious diseases by the subcutaneous or intravenous administration of a blood-serum containing an antibody (antitoxic, bactericidal, etc.) which is specific to the particular disease. As generally used, however, the term includes also the treatment of some of these affections by the toxic products (toxins) of attenuated cultures of their respective microbes; but these toxins, though sometimes grown on blood-serum, may be produced on other media, and are never administered in a serum, as the antibodies invariably are. These agents may be classified as follows:

Toxins, including tuberculin and other bacterial products employed for immunizing purposes. The attenuated virus of rabies, and the toxins of streptococci, bacillus prodigiosus, bacillus mallei, bacillus lepræ, and the cholera spirillum have been used for their respective diseases.

Antitoxic Sera, including those of diphtheria, typhoid and tetanus, the only ones in general use; though antitoxins for cholera, tuberculosis, and other diseases, have been used with more or less benefit. These sera act by neutralizing, through chemotaxis, the toxins generated by the bacilli.

Bactericidal Immune Sera, including those for typhoid, dysentery, tuberculosis, cholera and smallpox.

Immune but not Bactericidal, including the anti-pneumococcus, anti-streptococcus, and anti-staphylococcus sera.

Serum Antidiphthericum, *Antidiphtheric Serum*, *Diphtheria Antitoxin*, a fluid separated from the coagulated blood of a horse immunized through the inoculation of diphtheric toxin. Average dose, 3000 units; immunizing dose for well persons, 500 units. [A "unit" is the amount necessary to protect a 250-Gm. guinea-pig against 100 times the fatal dose of toxin.]

***Tuberculinum**, *Tuberculin* (Koch), is a glycerin extract of the culture fluid upon which the bacilli have been grown, concentrated to one-tenth its original volume, and filtered through porcelain to remove the bacilli. Initial dose, $\frac{1}{100}$ to $\frac{1}{10}$ mg., mixed with distilled water.

***Tetanus Antitoxin** is manufactured in liquid form, also as a dry powder to be dissolved in a specified quantity of distilled water. One severe case, reported by Coffin, received 180 c.c. in seven days, with eventual recovery. The serum is usually administered subcutaneously, but is also injected into the brain tissue, and into the spinal subarachnoid space.

***Small-pox Immunizing Serum** is derived from vesicles of heifers inoculated with cow-pox. It is usually prepared with glycerin and placed in glass capillary tubes.

Physiological Action.—*Antidiphtheric Serum* may cause certain untoward symptoms as cutaneous eruptions, swellings, etc., but these are not serious and are not attended with danger to life. Welch states that in over 100,000 injections the serious mishaps directly attributable to the serum can be counted on the fingers. Poisonous symptoms are not believed to be caused by the antitoxin, but are due to some other constituent of the serum possibly of an anaphylactic nature. The most common one is a rash, usually an erythema, but sometimes papular or urticarial, generally appearing about a week after the injection. Pains in and swelling of the joints are occasionally experienced, and symptoms of septicæmia have occurred.

Tuberculin, taken by the mouth, is inert, being probably digested in the stomach. In the dose of 1 mg. injected hypodermically upon healthy subjects, it gives rise to slight pains in the limbs and a transient sense of fatigue; but the same quantity injected upon tuberculous subjects produces a very powerful reaction both locally and generally, the constitutional effects being similar to those accompanying an acute exacerbation of the disease. About three hours after the injection a decided rigor occurs, which is followed by a rapid rise of temperature and pulse-rate; also pains in the limbs, a sense of great fatigue, drowsiness, nausea and loss of appetite, these effects lasting from 12 to 15 hours.

Typhoid Immunising Serum usually gives some systemic reaction, varying greatly in degree.

Small-pox Immunizing Serum will frequently give a more or less pronounced reaction.

Therapeutics.—These agents are each specific to its particular disease, but some have been found effective in other affections. In:

Diphtheria, the use of the Anti-diphtheric Serum has become almost universal, and has reduced the general mortality of the disease from 40 per cent. and more to 15 per cent. and less; while if laryngeal and

operative cases are excluded the mortality has been lowered to 5 per cent. *Pneumonia*, *Typhoid Fever*, *Pertussis* and *Asthma* are among the diseases which have been benefited by Antidiphtheric Serum.

Tuberculosis in its initial stage is amenable to Tuberculin, also when the case is one of simple infection (Koch); but this agent and its derivatives have not proven successful generally. It is frequently employed as a test-injection for tuberculous disease.

Tetanus has been treated successfully by its Antitoxin, and with somewhat better results than by other methods. As a prophylactic in cases where the disease may reasonably be suspected this agent has given good results.

Typhoid in the armies of several nations has been practically eradicated by preventive inoculation.

Small-pox, once a terrible scourge, is no longer even endemic because of general preventive vaccination.

Meningitis is now successfully treated with its Antitoxin.

Many Other Sera are being patiently investigated.

EVACUANTS

This division of the *Materia Medica* includes the remedies which promote some Evacuation from the body, as the Emetics, Expectorants, Cathartics, Anthelmintics, Diuretics and Emmenagogues, for a discussion of which see the Introduction under those titles.

EMETICS

Apomorphinæ Hydrochloridum, *Apomorphine Hydrochloride*, is the hydrochloride of an artificial alkaloid derived from morphine (see page 114). It is depressant to the heart, and has caused death by cardiac failure. Is the best emetic when swallowing is difficult, but is useless in narcotic poisoning after narcosis has blunted the vomiting centre. Dose, as an emetic, gr. $\frac{1}{15}$ – $\frac{1}{8}$ [av. gr. $\frac{1}{10}$], hypodermically.

Antimonii et Potassii Tartras, Antimony and Potassium Tartrate (Tartar Emetic). Dose, as emetic, gr. ss–j, but it is too slow and depressant for general use (see page 68).

Ipecacuanha is described separately (see next article).

Alumen, Alum, a teaspoonful in honey, every half hour. Is safe and efficient, but slow (see page 97).

Cupri Sulphas, Copper Sulphate, gr. iv, in water, every 15 minutes until emesis occurs; gr. xij may be given at one time in narcotic poisoning.

***Hydrargyri Subsulphas Flavus**, Yellow Mercuric Subsulphate, Turpeth Mineral, gr. iij-v, in powder, with Sugar of Milk. A good emetic in croup, being tasteless.

Sinapis Alba, vel Nigra, White or Black Mustard, as emetic, ʒij in water. Is irritant to the gastric mucosa, though carminative in small doses. Described under TOPICAL AGENTS.

Zinci Sulphas, Zinc Sulphate, gr. xv, in water, as an emetic. Is less irritant than the copper salt.

Physiological Action. All but one are local emetics, the first being a general or systemic emetic. The *Local Emetics* act chiefly by irritating the end-organs of the nerves in the pharynx, œsophagus or stomach; the *General or Systemic Emetic* by direct irritation of the vomiting centre in the medulla, acting through the medium of the circulation wherever introduced. Some agents act both ways, e.g., Tartar Emetic; also Ipecacuanha (see next article) and the Zinc and Copper Sulphates, but in the cases of these latter, their action on the stomach preponderates so much over their general action, that they are classed with the local emetics.

The action of local emetics does not continue long, does not extend much beyond the act of producing emesis, ceasing after the emetic has been evacuated, and is not accompanied by much general depression.

Therapeutics.—Emetics are employed for several purposes, among which may be mentioned the following:

1. To cause the expulsion of foreign bodies from any part of the œsophageal tract, or from the air passages.
2. To remove or evacuate the contents of the stomach.
3. To remove an obstruction from the gall-duct (?).

Contraindications for their use, are aneurism, atheroma, hemorrhagic diathesis, hernia, prolapsus uteri, and tendency to abortion (when subject is pregnant).

They are especially indicated in:

Narcotic Poisoning, the Copper Sulphate or Zinc Sulphate, the latter being usually preferred, as less irritant.

Croup and Diphtheria, to dislodge false membrane.

Indigestion, to relieve the overloaded stomach.

IPECACUANHA—Ipecac

Source and Composition.—Ipecac is the root of *Cephaelis Ipecacuanha*, or *C. acuminata*, Brazilian shrubs of the nat. ord. Rubiaceæ. It contains the alkaloids *Cephaeline* and *Emetine*, the glucoside *Ipecacuanhic Acid*, also gum, starch, etc., and a trace of a volatile oil. Dose, of the powdered root as an expectorant, gr. ss-ij [av. gr. j]; as an emetic, gr. x-xxx [av. gr. xv].

Preparations and Derivatives.

Fluidextractum Ipecacuanhæ, Fluidextract of Ipecac. Dose, as an expectorant, ℥ss-ij [av. ℥j]; as an emetic, ℥x-xxx [av. ℥xv].

Syrupus Ipecacuanhæ, Syrup of Ipecac, 7 per cent. Dose, as an expectorant, ℥x-xx [av. ℥xv]; as an emetic, ʒij-vj [av. ʒiv].

**Vinum Ipecacuanhæ*, Wine of Ipecac, 10 per cent. Dose, as an expectorant, ℥x-xx [av. ℥xv]; as an emetic, ʒij-iv.

Pulvis Ipecacuanhæ et Opii (see page 115) has 10 per cent. of Ipecac. Dose, gr. iij-xv [av. gr. viij].

**Tinctura Ipecacuanhæ et Opii* (see page 115) has 10 per cent. of Ipecac. Dose, ℥iij-xv [av. ℥viij].

**Pilula Laxativa Compositæ* (see under Aloes) have in each pill gr. $\frac{1}{16}$ of Ipecac. Dose, j-iv [av. ij].

Emetinæ Hydrobromidum, Emetine Hydrobromide, readily soluble in water. Dose, gr. $\frac{1}{8}$.

**Ipecacuanha De-emetinisata*, De-emetinized Ipecac, is Ipecac deprived of its emetic alkaloids, for use in dysentery. Dose, gr. v-xx.

Physiological Action.—Ipecac is nauseant, emetic, reflexly expectorant and diaphoretic, sternutatory and counterirritant. Locally, applied to skin or mucous membrane, it acts as an irritant, and may cause pustulation. Inhaled as a powder, it excites violent sneezing and reflex mucous secretion; on some persons having an especially irritant action, so that the most infinitesimal quantity by inhalation will in them induce an asthmatic paroxysm. In the stomach it irritates the mucous membrane and the vagus terminations, and causes prompt emesis; absorbed into the blood it is excreted in part by the stomach, producing the same result. In medicinal doses it increases the mucous secretions in a marked degree, and is slightly diaphoretic. Small doses (gr. $\frac{1}{8}$ - $\frac{1}{4}$) act as a stomachic tonic and stimulant to the gastric secretions. Emetic doses repeated result in tolerance on the part of the stomach, when catharsis is set up, the stools having a

peculiar "grass-green" color, a bilious character, and looking as if they were fermented. By continuance of the drug the intestinal canal will also acquire tolerance, the cathartic action ceasing. In poisonous doses it has frequently produced hæmoptysis and other hemorrhages.

Emetine possesses strong constringent action on the blood-vessels and is powerfully emetic. It causes death in animals by cardiac paralysis, and the autopsies show evidence of gastro-intestinal irritation and hyperæmic lungs with patches of hepatization.

Antagonists, Antidotes, etc.—The emetic action is antagonized by the Narcotics generally, also by Bismuth, Phenol, and Hydrocyanic Acid. Incompatibles are salts of Lead and Mercury, Vegetable Acids and astringent infusions.

Therapeutics.—As an emetic Ipecac is much used, being safe, non-depressant, and sure, though somewhat slow. It is also employed as an expectorant in bronchitis when the secretion is scanty, and as an anti-dysenteric. It is generally administered in:

Bilious Headache, acute indigestion, and similar conditions, gr. iv of the powder in warm water, or a teaspoonful of the syrup, every $\frac{1}{4}$ hour until emesis occurs, to empty the overloaded stomach.

Laryngismus Stridulus, *Spasmodic Croup*, etc., the Syrup is a favorite emetic, which sometimes cuts short an attack if given early and freely.

Dysentery, of the tropics especially, is treated by Ipecac in large doses (gr. xx-xxx every 4 hours) pushed to tolerance.

Vomiting, especially when of nervous origin, small doses (Mj) of the wine, frequently repeated, will relieve in many cases, perhaps through a sedative influence on the vagus.

Coughs at night, also in *Acute Catarrh* and *Bronchitis*, it is a very efficient remedy; also in *Hay Fever* and *Spasmodic Asthma*, in all of which slight nausea must be produced before relief will be experienced. The wine, as a spray, is highly recommended in winter cough and bronchial asthma.

Jaundice from catarrh of the bile-ducts, Ipecac to lessen the viscosity of the mucus stopping up the ducts.

Pyorrhæa, Emetine as an amœbicide.

EXPECTORANTS

Expectorants are divided into nauseating and stimulant groups (see page 29). They are generally described under *Emetics*, as Apomorphine,

Tartar Emetic, and Ipecac; under *Motor Depressants*, as *Grindelia* and *Lobelia*; under *Motor Excitants*, as *Nux Vomica*, *Pilocarpus*, and *Squill*, under *Antisymotics*, as *Benzoin*; and under *Agents Producing Waste*; as the Ammonium salts. Others are *Senega*, which is described in the next article, and *Eriodictyon*. None of these agents has been shown conclusively to possess any real power in stimulating or increasing the mucous secretions of the respiratory tract.

Eriodictyon, *Eriodictyon* (*Yerba Santa*), the leaves of *Eriodictyon californicum*, a shrub of the nat. ord. *Hydrophyllaceæ*. It is a lauded expectorant, employed in bronchial and laryngeal affections, and covers the taste of Quinine in a remarkable manner. Dose, of the fluidextract, ℥v-xxx [av. ℥xv]; of an elixir or Syrup, ʒj-ij. When employed as a vehicle for the cinchona alkaloids, about ʒj of the elixir is necessary for each 10 or 15 grains.

SENEGA—Senega

Source and Composition.—Senega is the dried root of *Polygala Senega*, an indigenous, perennial plant of the nat. ord. *Polygalaceæ*, having small, white flowers in a close spike at the summit of the stem. Its principal constituent is the glucoside *Senegin*, which is identical with Saponin and closely allied to Digitonin.

Preparations.

Fluidextractum Senegæ, Fluidextract of Senega. Dose, ℥x-xxx [av. ℥xv].

Syrupus Senegæ, Syrup of Senega, 25 per cent. Dose, ʒj-ij [av. ʒj].

Syrupus Scillæ Compositus, Compound Syrup of Squill (see page 179), has 8 per cent. of Senega. Dose, ℥xx-xlv [av. ℥xxx].

Physiological Action.—Senega is a stimulating expectorant, a diuretic and a diaphoretic. It causes irritation of the throat, with some salivation and gastro-intestinal irritation and an inclination to cough, increased bronchial secretion, and perhaps some diuresis and diaphoresis. Inhaled as a snuff it is very irritant to the mucous membrane of the nose, causing cough, sneezing and nasal catarrh. Senegin is violently irritant and a powerful depressant of the heart, and the vascular, nervous and muscular systems. It is excreted by the kidneys and the skin, both of which it stimulates and in large quantity irritates.

Therapeutics.—The use of Senega is chiefly that of a stimulating expectorant and a diuretic. In:

Chronic Bronchitis, and the second stage of acute bronchitis, it is advocated for removing tightness and oppression, relieving cough, and promoting expectoration.

Asthma of bronchial form, it is beneficial.

Senega presents no advantages over Ipecac while being more irritant, and would seem to be quite superfluous.

CATHARTICS

Cathartics are subdivided into Laxatives, also Simple; Saline, Drastic, Hydragogue and Cholagogue Purgatives (see page 24).

LAXATIVES

Sulphur Lotum, Washed Sulphur (see page 70). Dose, ʒj-ij, as a laxative. It forms 8 per cent. of the *Pulvis Glycyrrhizæ Compositus*.

Manna, the concrete exudation of *Fraxinus Ornus*. Dose, ʒj-ʒj [av. ʒiv]. Contains *Mannit*, a sugar; also a *Resin*, probably the laxative principle.

***Tamarindus, Tamarind**, the preserved pulp of the fruit of *Tamarindus Indica*. Used in *Confectio Sennæ*. Dose, ʒj-ʒj [av. ʒiv].

Magnesiæ Carbonas, Magnesium Carbonate. Dose, gr. x-ʒj [av. gr. xlv]. A mild laxative and antacid, but if long used it may form intestinal concretions.

**Mistura Magnesiæ et Asafætidæ*, Mixture of Magnesia and Asafetida (Dewee's Carminative), has of the Carbonate 5, Tinct. of Asafetida 7, Tinct. of Opium 1, Sugar 10, Distilled Water to 100. Dose, ʒss-iv, for flatulent colic and diarrhœa. Now obsolete.

Oleum Ricini, Castor Oil, is a laxative in small doses (ʒj), though classed with the simple purgatives (see below). Also all the Simple Purgatives in minimum doses may be classed as laxatives.

Fruits of various kinds, particularly Figs, Prunes, Stewed Apples, Raspberries and Strawberries, many of which act through the mechanical stimulation of intestinal peristalsis by their small, indigestible seeds.

SIMPLE PURGATIVES

Aloë, Aloes, the inspissated juice of the leaves of *Aloë vera* (Barbadoes Aloes), *Aloë Perryi* (Socotrine Aloes), *Aloë Chinensis*, or other species

of *Aloë*, nat. ord. Liliaceæ. Contains *Soaloin*, a variety of the principle *Aloin*, which is common to all varieties of the plant; also resin, a volatile oil, etc. Dose, gr. j-vj [av. gr. iv].

Aloë Purificata, Purified Aloes. Dose, gr. j-vj [av. gr. iv].

**Extractum Aloes*, Extract of Aloes. Dose, gr. ss-v [av. gr. ij].

Tinctura Aloes, Tincture of Aloes, 10 per cent. Dose, ℥x-℥j [av. ℥xxx].

Pilulæ Rhei Compositæ, Compound Rhubarb Pills, each pill has of Rhubarb powder, 13 per cent.; Aloes, 10 per cent.; Myrrh, 6 per cent.; Oil of Peppermint, 0.5 per cent. Dose, j-ij [av. ij].

Aloinum, Aloin, the neutral principle, soluble in about 65 of water. Dose, gr. $\frac{1}{8}$ - $\frac{1}{2}$ [av. gr. $\frac{1}{4}$].

The Other Official Preparation is the Pills of Aloes.

Rheum, *Rhubarb*, the dried rhizome of *Rheum officinale*, *Rheum palmatum*, or probably other species of *Rheum*, nat. ord. Polygonaceæ, grown in China and Thibet. It contains three cathartic principles, *Chrysophan*, *Emodin*, and *Rhein*; also bitter resins, a variety of tannic acid, etc. Dose of the powdered root, as a purgative, gr. x-xxx [av. gr. xv].

Extractum Rhei, Extract of Rhubarb. Dose, gr. j-x [av. gr. iv].

Fluidextractum Rhei, Flex. of R. Dose, ℥x-xxx [av. ℥xv].

Pilulæ Rhei Compositæ, Compound Pills of Rhubarb, each pill has of Rhubarb about gr. ij, Aloes gr. $\frac{1}{2}$, Myrrh gr. j, Oil of Peppermint gr. o.i. Dose, j-v [av. ij] pills.

Syrupus Rhei, Syrup of Rhubarb, 10 per cent. Dose for an infant ℥j; for older children ℥j-iv [av. ℥ij].

Other Official Preparations are: the Tincture, Aromatic Tincture, Aromatic Syrup and the Compound Powder.

Senna, the leaflets of *Cassia acutifolia* or *Cassia angustifolia*. Contains a glucoside, named *Cathartic Acid*, which is probably the active principle; also *Sennacrol*, *Sennapicrin*, bitter glucosides; *Cathartomannit*, a peculiar unfermentable sugar, and some *Chrysophanic Acid*.

Fluidextractum Sennæ, Fluidextract of Senna. Dose, ℥x-℥j [av. ℥xxx].

Syrupus Sennæ, Syrup of Senna, 25 per cent. Dose, ℥ss-ij [av. ℥j].

**Confectio Sennæ*, Confection of Senna, has 10 per cent. of Senna, with Cassia Fistula, Tamarind, Prune, Fig, etc. Dose, ℥ss-ij [av. ℥j].

Infusum Sennæ Compositum, Compound Infusion of Senna (Black Draught), has of Senna 6, Manna 12, Magnesium Sulphate 12, Fennel 2, Boiling Water 80, Cold Water to 100. Dose, ℥ij-vj [av. ℥iv].

Pulvis Glycyrrhizæ Compositus, Compound Licorice Powder, has of Senna 18, Licorice 23½, Oil of Fennel 0.4, Washed Sulphur 8, Sugar 50. Dose, ʒss–ij [av. ʒj].

Oleum Ricini, *Castor Oil*, a fixed oil expressed from the seeds of *Ricinus communis*. The purer it is the less purgative. It consists mainly of *Ricinoleic Acid*, combined with glycerin, forming *Ricinolein*. The seeds contain also a highly toxic ferment named *Ricin*, and an inert alkaloid *Ricinine*. Dose, ʒij–ʒj or more [av. ʒiv].

Rhamnus Purshiana, *Cascara Sagrada* (Chittem or Sacred Bark), is the bark of *Rhamnus Purshiana*, the California Buckthorn, and contains several Resins, also a volatile oil, much tannin, etc.

Extractum Cascaræ Sagradæ. Dose, gr. j–vj [av. gr. iv].

Fluidextractum Cascaræ Sagradæ. Dose, ℥x–xxx [av. ℥xv].

Fluidextractum Cascaræ Sagradæ Aromaticum, contains Licorice, Magnesia, Spirit of Orange, etc. Dose, ℥x–xxx [av. ℥xxx].

Frangula, *Buckthorn*, is the bark, collected at least one year before being used, of *Rhamnus Frangula*, or Alder buckthorn, a European shrub (nat. ord. Rhamnæ). It contains a cathartic glucoside named *Frangulin*, or *Rhamnoxanthin*, insoluble in water, and but sparingly so in alcohol or ether, and thought to be identical with the active principle of Senna. *Fluidextractum Frangulæ*. Dose, ℥x–xxx [av. ℥xv].

SALINE PURGATIVES

Magnesium Salts.—The chief ones are the following:

Magnesiæ Sulphas, Magnesium Sulphate (Epsom Salt), is very soluble in water. Dose, ʒj–ʒj [av. ʒiv], in plenty of water.

Liquor Magnesiæ Citratis, Solution of Magnesium Citrate, prepared from Magnesium Carbonate, Citric Acid, etc. Dose, ʒvj–xx [av. ʒxij].

Potassium Salts.—the principal ones are:

Potassii Bitartras, Potassium Bitartrate (Cream of Tartar), is sparingly soluble in water. Dose, ʒss–j as a purgative; gr. xx–ʒj [av. gr. xxx], as a diuretic. Is a constituent of *Pulvis Jalapæ Compositus*.

Potassii et Sodii Tartras, Rochelle Salt (see page 61 for this salt and Seidlitz Powder, of which it is a constituent).

Sodium Salts.—Those generally employed are:

Sodii Sulphas, Glauber's Salt. Dose, ʒss (see page 63).

Sodii Phosphas, Sodium Phosphate. Dose, as a purgative ʒj. Has some pronounced cholagogue action, especially on children in 3- to 10-grain doses. Acts gently, and has relatively little taste (see page 50 for this salt and its preparations).

DRASTIC PURGATIVES

Jalapa, *Jalap*, the tuberous root of *Exogonium Purga*, a Mexican plant of the nat. ord. Convolvulaceæ. It should contain not less than 8 per cent. of total Resin, which is composed of two glucosides, *Jalapin* and *Convolvulin*, the latter being the more active of the two. Dose, gr. v-x [av. gr. xv].

Resina Jalapæ, Resin of Jalap. Dose, gr. j-v [av. gr. ij].

Pulvis Jalapæ Compositus, Compound Jalap Powder (*Pulvis Purgans*), has of Jalap 35, Potassium Bitartrate 65, thoroughly mixed. Dose, gr. x-xlv [av. gr. xxx].

Jalap is an ingredient of the Compound Cathartic Pills, and the Vegetable Cathartic Pills (see below under *Colocynthis*).

Colocynthis, *Colocynth*, the fruit of *Citrullus Colocynthis*, the "bitter cucumber," a vine of the nat. ord. Cucurbitaceæ, which also includes *Ecballium Elaterium*, *Cucurbita Pepo*, and *Bryonia alba*. *Colocynth* contains an active, purgative glucoside, *Colocynthin*; also *Colocynthitine*, which is soluble in ether, insoluble in water, and not purgative; and *Colocynthein*, a resin. Dose, gr. ss-jss [av. gr. j].

Extractum Colocynthidis. Dose, gr. ¼. Not used alone.

Extractum Colocynthidis Compositum has of the Extract 16, Aloes 50, Cardamon 5, Resin of Scammony 14, Soap 14, and Alcohol 10 parts. Dose, gr. iv.

Pilula Cathartica Composita, Compound Cathartic Pills, have of the preceding 8, Calomel 6, Resin of Jalap 2, Gamboge 1½, diluted alcohol to make 100 pills. Dose, j-ij [av. ij] pills.

**Pilula Cathartica Vegetabiles*, Vegetable Cathartic Pills, have of the compound Extract 6, Resin of Jalap 2, Resin of Podophyllum 1.5, Extr. of Hyoscyamus 3, Extr. of Leptandra 1.5, Oil of Peppermint 0.8, and Water, for 100 pills. Dose, j-ij [av. ij].

Cambogia, *Gamboge*, a gum-resin from *Garcinia Hanburii*, from Siam.

Pilula Cathartica Composita, Compound Cathartic Pills (see above).

Scammonium, *Scammony*, a resinous exudation from the root of *Convolvulus Scammonia*. Contains a Resin, which consists chiefly of

Jalapin, the active principle, probably identical with the Convolvulin of Jalap.

Resina Scammonii, Resin of Scammony. Dose, gr. j-v [av. gr. iij].

Is a constituent of the Compound Extract of Colocynth.

Oleum Tiglil, *Croton Oil*, a fixed oil expressed from the seeds of *Croton Tiglium*. Contains several fatty and volatile acids, one of which is called *Tiglinic Acid*. Dose, ℥ $\frac{1}{8}$ -j [av. ℥ss], in pill of bread-crumbs.

Elaterinum, *Elaterin*, a neutral principle from *Elaterium*, a substance deposited by the juice of the fruit of *Ecballium Elaterium*, the "squirt-ing cucumber," nat. ord. Cucurbitaceæ. Dose, gr. $\frac{1}{2}$ o.

Trituratio Elaterini, Trituration of Elaterin, 10 per cent., with Sugar of Milk. Dose, gr. $\frac{1}{4}$ -j [av. gr. ss].

"CHOLAGOGUE" PURGATIVES

Podophyllum, *May-apple*, the rhizome and rootlets of *Podophyllum peltatum*, the Mandrake (nat. ord. Berberidæ). Its active principle is a Resin which is official, and is a compound of several resins. It probably contains also the alkaloid *Berberine*.

Fluidextractum Podophylli. Dose, ℥j-xx [av. ℥vii].

Resina Podophylli, Resin of Podophyllum, is an ingredient of the Vegetable Cathartic Pills. Dose, gr. $\frac{1}{8}$ -j [av. gr. $\frac{1}{6}$].

**Pilula Podophylli*, *Belladonna et Capsici*, have in each pill gr. $\frac{1}{4}$ of the above Resin, with Extr. of Belladonna gr. $\frac{1}{8}$, and Capsicum gr. ss. Dose, i-ij [av. j] pills.

**Leptandra*, *Culver's Root*, the rhizome and rootlets of *Veronica virginica*. Contains a Resin, and a glucoside, also *Saponin*, tannin, etc. The *Leptandrin* of the shops is an impure resin. Dose, gr. x-xx [av. gr. xv].

**Extractum Leptandræ* is a constituent of the Vegetable Cathartic Pills. Dose, gr. j-v [av. gr. iv].

**Fluidextractum Leptandræ*. Dose, ℥x-xx [av. ℥xv].

**Iris*, *Blue Flag*, the rhizome and roots of *Iris versicolor*. The *Iridin* of the shops is an impure oleo-resin precipitated from an alcoholic solution. Dose, of the powdered root gr. v-xx; of the extract gr. j-v; of the fluidextract ℥v-xx.

Hydrargyri Chloridum Mite, *Calomel*. Dose, gr. j-v (see page 75).

Hydrargyrum cum Creta, *Gray Powder*. Dose, gr. ss-x (see page 75).

Massa Hydrargyri, *Blue Mass*, *Blue Pill*. Dose, gr. j-x (see page 75).

Aloes, Rhubarb, Jalap, Scammony, Sodium Sulphate and Phosphate, may be classed with the "cholagogue" purgatives; as also all cathartics which act upon the duodenum, and prevent the absorption of the once-secreted bile; such being *Baptisin, Colocynih*, etc.

Action of Cathartics.—*The Laxatives* simply relax and unload the intestinal canal, without causing active purgation, or increase of the intestinal secretions. *Saline Purgatives* produce watery stools, by increasing secretion and stimulating peristalsis. *Drastic Purgatives* cause violent action of the bowels, in large doses setting up enteritis and symptoms of irritant poisoning. Those which excite a copious flow from the intestinal mucous membrane are called *Hydragogue Purgatives*, some of which belong to the drastic group (*Elatarium, Gamboge*), and some to the saline (*Potassium Bitartrate*). *Cholagogue Purgatives* are those which remove bile from the body, chiefly by causing increased peristalsis of the duodenum, and thus preventing the reabsorption of the bile therein; they and the *Mercurial Purgatives* are now believed not to affect the secretion of bile, but they markedly stimulate the glands situated in the duodenum, jejunum, and ileum.

Therapeutics.—Cathartics are indicated for the purposes of unloading the bowels of fecal matter or offending materials, depletion of the vascular system in many diseases, promotion of resorption in general dropsy, ascites, etc., revulsion in inflammation of the brain, etc., elimination of the products of the retrograde metamorphosis, lowering of the temperature in fever, lowering of the blood-pressure, and excitation of the pelvic circulation. For the last purpose *Aloes* is the only agent used. *Castor Oil* is much used, and abused, especially in the puerperal state, where it is very apt to produce hemorrhoids. The following drugs are relatively inactive in the absence of bile: *podophyllum, jalap, scammony, rhubarb*, and (in part) *gamboge*.

The various agents enumerated under this title have other actions and uses besides that of catharsis, but the limitations of this volume prevent their discussion.

DIURETICS

REFRIGERANT DIURETICS

Aqua, Water, H₂O, is potable water in its purest attainable state. Used freely it is an efficient diuretic in renal insufficiency and other affections, especially if taken hot.

Potassium Salts (see page 60), especially the Acetate, Bitartrate, Carbonate, Citrate and Nitrate. They should be largely diluted with water, that fluid of itself having very considerable diuretic power.

Potassii Citras, Potassium Citrate. Dose, gr. x-xxx [av. gr. xx].

Potassii Nitras, Potassium Nitrate. Dose, gr. v-xx [av. gr. xv].

HYDRAGOGUE DIURETICS

Spiritus Ætheris Nitrosi, *Spirit of Nitrous Ether*, *Sweet Spirit of Nitre* (see page 103), is diuretic in a dose of ℥ij, but is generally employed as an adjuvant to more powerful agents of the same class.

Mistura Glycyrrhizæ Composita contains 3 per cent. of it.

Caffeine, the Citrated Caffeine in doses of gr. v, is the most reliable hydragogue diuretic (see page 128).

Theobrominæ Sodio-salicylas is efficiently diuretic in doses of gr. x-xv, several times a day (see page 129).

Digitalis, *Foxglove* (see page 171), as a diuretic, gr. j of the powdered drug daily in divided doses, increased by a grain daily. The Infusion is the best preparation as a diuretic, in doses of ℥ij. A poultice of ℥j of the fresh leaves over the abdomen for four hours, is also efficient. Care must be taken to avoid poisoning.

Hydrargyrum, *Mercury*, the Mild Chloride (Calomel), is a very efficient diuretic, especially in cardiac affections. Dose, gr. ss-j. Hydrarg. cum Creta, with Pulv. Digitalis and Pulv. Scillæ, gr. j of each, in pill thrice daily, is a classical diuretic (see page 75).

Scilla, *Squill* (see page 179). Dose of the powdered drug, gr. jss. *Tinctura Scillæ*. Dose, ℥v-xxx [av. ℥xv].

***Scoparius**, *Broom* (see page 178), the diuretic action is believed to be due to the principle Scoparin [but the alkaloid Sparteine is also diuretic]. Dose of Broom-tops in decoction (℥j to the pint), ℥j every 3 hours.

Sparteina Sulphas, Sparteine Sulphate. Dose [as a diuretic, gr. j-ij, thrice daily]; for cardiac action, gr. ¼-½.

Strophanthus (see page 174). Dose of the tincture, ℥v-x, or ℥ss-ij frequently repeated.

Cimicifuga (see page 175). Dose of the tincture, ℥x-℥j [av. xv].

***Convallaria** (see page 177). Dose of the infusion, ℥ss-ij.

IRRITANT DIURETICS

**Apocynum*, *Canadian Hemp*, the root of *Apocynum cannabinum*. Is a diuretic in doses of gr. xv; in larger doses it is a hydragogue cathartic and an emetic. It has been used with asserted benefit in anasarca and ascites.

Buchu, the leaves of *Barosma betulina*, nat. ord. Rutaceæ. It contains a Volatile Oil, and *Barosmin*, a bitter principle. Dose of the fluid-extract, ℥xv-xl [av. ℥xxx]. An infusion (℥j to the pint) may be used in doses of ℥ss-ij.

Capsicum, *Cayenne Pepper*, the fruit of *Capsicum fastigiatum*, contains *Capsicin*, a peculiar liquid principle; also a Volatile Alkaloid.

Oleoresina Capsici, gr. ¼-j [av. gr. ss].

Tinctura Capsici, ℥v-xx [av. ℥vii].

**Chimaphila*, *Pipsissewa*, the leaves of *Chimaphila umbellata*, contain *Chimaphilin*, a crystalline principle, also *Arbutin*, Tannin, etc. Dose of the fluidextract, ℥x-℥j [av. ℥xxx].

Copaiba, the oleo-resin of various species of *Copaiba*, contains a Volatile Oil, and a Resin composed chiefly of *Copaibic Acid*. Differs from the true balsams in that it contains no cinnamic acid. Dose of *Copaiba*, ℥x-xxx [av. ℥xv].

Cubeba, *Cubeb*, the unripe fruit of *Piper Cubeba*, contains *Cubebin* a neutral principle, a Volatile Oil which may be separated into *Cubebene*, a camphor, and *Cubeben*, also a Resin which contains *Cubebic Acid*.

Oleoresina Cubebæ, ℥v-xx [av. ℥vijss]. *Oleum Cubebæ*, ℥v-xx [av. ℥vii].

**Fluidextractum Cubebæ*. Dose, ℥v-xxx [av. ℥xv].

Juniperus, *Juniper*, the fruit of *Juniperus communis*, contains *Juniperin* a non-crystalline principle, also a Volatile Oil, etc.

Oleum Juniperi, ℥j-v [av. ℥ii]. *Spiritus Juniperi*, ℥i-iv [av. ℥ss].

Spiritus Juniperi Compositus resembles Gin. Dose, ℥j-iv [av. ℥ij].

Oleum Cadini, Oil of Cade, Empyreumatic Oil of Juniper, locally.

**Matico*, the leaves of *Piper angustifolium*, contain a Volatile Oil and a Resin, also *Artanthic Acid*, and Tannin.

Fluidextractum Matico. Dose, ℥ss-jss [av. ℥j].

**Pareira*, the root of *Chondodendron tomentosum*, contains *Buxine* an alkaloid principle, also called *Cissampeline*, or *Pelosine*. Dose of the fluidextract, ℥x-xlv [av. ℥xxx].

Piper, Black Pepper, the unripe fruit of *Piper nigrum*, contains *Piperine* a feeble principle (official), also a Resin and an Essential Oil. Dose of the oleoresin, gr. $\frac{1}{4}$ -j [av. gr. ss].

Terebinthina, Turpentine, and its derivatives, are described in the next article.

Uva Ursi, Bear-berry, the leaves of *Arctostaphylos Uva-ursi*, contain Tannic and Gallic acids, and three principles *Arbutin*, neutral, bitter, crystalline; *Ericolin*, bitter, amorphous; and *Ursone*, neutral, tasteless, and crystalline. Dose of the powdered leaves, gr. x-3j [av. gr. xxx], in infusion or decoction; of the fluidextract, ℥x-3j [av. ℥xxx].

**Arbutinum*, Arbutin, is an efficient diuretic in doses of gr. v-xv.

***Zea, Corn Silk** (*Stigmata Maydis*), the styles and stigmas of *Zea Mays*, the Maize or Indian Corn. It is diuretic, demulcent and antiseptic, and is highly recommended in cystitis, as a mild diuretic in cardiac and renal affections, and as a corrective of nocturnal incontinence of urine. Dose of a fluidextract, 3j-ij; of an infusion (1 to 8) ʒiv-viij. There are no official preparations.

Physiological Action of Diuretics.—*The Refrigerant Diuretics* modify rather than increase the urine, and exercise a sedative action upon the heart and circulation. Used to excess they depress the heart and impoverish the blood. Potassium Chlorate is a decided renal irritant, and should never be used as a diuretic. *Hydragogue Diuretics* increase the water of the urine largely, and in general act by raising arterial pressure, either: (a) throughout the body, or (b) locally in the kidneys. This they accomplish in various ways, direct and indirect, increasing the action of the heart, contracting the efferent vessels so as to raise the pressure in the glomeruli, dilating the afferent vessels, etc. *The Irritant Diuretics* are largely eliminated by the kidneys, and act upon the entire genito-urinary mucous membrane by local irritation, which in excess causes inflammation and symptoms of a violent character, as strangury, bloody urine, etc. *All the members of this group should be used with great caution.* For the diuretic action of *Digitalis* see page 172.

Therapeutics of Diuretics.—These agents are employed in medicine for certain definite purposes, viz.: (1), to remove fluid from the tissues and cavities of the body in cases of dropsy; (2), to promote the elimination of waste-products and other poisons from the blood; (3), to maintain the action of the kidneys; and (4), to dilute the urine, and to alter morbid

conditions of that excretion. For the last-named purpose, the best agent is Distilled Water charged with CO_2 . For use in:

Dropsies from Cardiac Disease, the most efficient diuretics are *Digitalis* and its congeners, also Caffeine, Squill, etc., which act on the general vascular system. Their action is aided by a little *Massa Hydrargyri*.

Dropsy from Renal Disease, Broom, Juniper and Nitrous Ether, are the most reliable diuretics. Juniper should be used *cautiously*.

Dropsy from Cirrhosis of the Liver, Caffeine, the Citrates, Squills, the infusion of Broom.

Elimination of Waste-products from the blood, Potassium salts, especially the Nitrate and Citrate, also Juniper, Caffeine, etc.

As Adjuvants to Diuretics, when pressure on the uriniferous tubules, or venous congestion, prevent their action, paracentesis abdominis, purgation, cupping over the loins, and even venesection, are often necessary to start the action, or temporarily relieve conditions.

TEREBINTHINA—Turpentine

A **Turpentine** is an oleo-resinous exudation, liquid or concrete, consisting of a *Resin* combined with a particular Oil, named *Oil of Turpentine* ($\text{C}_{10}\text{H}_{16}$), and generally procured from various species of the nat. ord. Pinaceæ. The Turpentine is no longer official.

***Terebinthina, Turpentine**, a concrete oleo-resin obtained from *Pinus palustris*, the yellow pine, and from other species of *Pinus* (nat. ord. Pinaceæ). Tough, yellow masses, of terebinthinate odor and taste. Dose, as a stimulant, antispasmodic or diuretic, gr. v-xxx; as an anthelmintic, ʒij-iv.

***Terebinthina Canadensis, Canada Turpentine (Balsam of Fir)**, is a liquid oleoresin, obtained from *Abies balsamea*, the silver fir or Balm of Gilead (nat. ord. Coniferæ). A viscid, yellowish liquid, on exposure drying into a transparent mass, completely soluble in ether, chloroform or benzol. Dose, gr. x-xxx.

***Chian Turpentine**, from the *Pistacea Terebinthus*, a small larch growing in Chio and Cyprus. Dose, gr. ij-v.

***Venice Turpentine**, from the *Larix Europæa*, or European larch, procured as a viscid liquid in Switzerland. Is not the "Venice Turpentine" of commerce, which usually consists of rosin dissolved in oil of turpentine.

*Thus *Americanum, Frankincense* (B. P.), the concrete turpentine which is scraped off the trunks of *Pinus Australis* and *Pinus Tæda*, Southern States of N. America. An ingredient of the *Emplastrum Picis* of the B. P.

Preparations of Turpentine.

Oleum Terebinthinæ, Oil of Turpentine, commonly called "Spirits of Turpentine." Is soluble in 3 volumes of alcohol, and takes fire when in contact with a mixture of nitric and sulphuric acids. It is a mixture of several hydrocarbons, each having the same formula as itself, viz., $C_{10}H_{16}$.

Oleum Terebinthinæ Rectificatum, Rectified Oil of Turpentine, is the preparation which should be dispensed for internal use. Dose, as a stimulant or diuretic, \mathfrak{M} v in emulsion, 3 to 6 times daily; as a cathartic or anthelmintic, \mathfrak{J} ss or more, combined with other cathartics. A little glycerin and Oil of Gaultheria will disguise the taste.

Emulsum Olei Terebinthinæ, Emulsion of Oil of Turpentine, has of the Rectified Oil 15, Expressed Oil of Almond 5, Syrup 25, Acacia 15, Water to 100. Dose, \mathfrak{J} ss.

Linimentum Terebinthinæ, Turpentine Liniment, has 35 of the oil with 65 of Rosin Cerate.

Derivatives of Turpentine

Resina, Rosin (Colophony), is the residue left after distilling off the volatile oil from turpentine; the portion of turpentine which is fixed by oxidation, consisting in greater part of *Abietic anhydride*.

Ceratum Resinæ, Rosin Cerate, has of Rosin 35, Yellow Wax 15, Lard 50.

It forms 65 per cent. of Turpentine Liniment.

**Ceratum Resinæ Compositum*, Compound Rosin Cerate, has of Rosin $22\frac{1}{2}$, Yellow Wax $22\frac{1}{2}$, Suet 30, Turpentine $11\frac{1}{2}$, Linseed Oil $13\frac{1}{2}$.

Terebenum, Terebene, $C_{10}H_{16}$, is a hydrocarbon obtained by the oxidation of oil of turpentine by means of sulphuric acid. A colorless liquid, of hot taste, soluble in alcohol. Dose, \mathfrak{M} iv on sugar, or suspended in \mathfrak{J} ss of water by the aid of gr. xx of light carbonate of magnesium.

Terpini Hydras, Terpin Hydrate, is the hydrate of the diatomic alcohol Terpin (Terebinthene), obtained by distilling oil of turpentine with an alkali. Dose, gr. j-v (av. gr. iv).

Analogues of Turpentine

**Juniperus*, *Juniper*, the fruit of *Juniperus communis*, a shrub of the nat. ord. Coniferæ (see page 232).

**Sabina*, *Savin*, the tops of *Juniperus Sabina*, a shrub of the nat. ord. Coniferæ, resembling Red Cedar (*Juniperus virginiana*), but of smaller size and having larger fruit. Dose, gr. v-x [av. gr. vijss].

Fluidextractum Sabina, Fluidextr. of Savin. Dose, ℥ij-x [av. ℥v].

Oleum Sabina, Oil of Savin, isomeric with oil of turpentine. Dose, ℥j-ij [av. ℥j].

Pix, *Pitch*, is a resinous exudation from the stem of certain trees of the genera *Pinus* (Pine) and *Abies* (Fir and Spruce); and may also be obtained as a residue of the distillation of Tar. The only official form is:

Pix Liquida, *Tar*, is an empyreumatic oleoresin (a "bituminous liquid," B. P.), obtained by the destructive distillation of the wood of *Pinus palustris*, and of other species of *Pinus* (nat. ord. Pinæ). A thick, viscid, semi-fluid, of brownish-black color, acid reaction, slightly soluble in water, soluble in oils, alcohol, and in solution of potassa or soda. It consists chiefly of Oil of Turpentine, Creosote, Phenols, Pyrocatechin, Acetic Acid, Acetone, Xylol, Toluol, Methylic Alcohol, and Resins. By distillation it yields Pyroligneous Acid and a Volatile Oil, the residue being Pitch. Dose, gr. x-xx [av. gr. vijss], in pill, up to ʒij daily.

* **Pix Burgundica**, *Burgundy Pitch*, the prepared, resinous exudation of *Abies excelsa*, Norway spruce, nat. ord. Coniferæ. Hard, brittle, opaque masses, very fusible, readily soluble in glacial acetic acid. Used for plasters.

* **Pix Canadensis**, *Canada or Hemlock Pitch*, the prepared resinous exudation of *Abies Canadensis*, the hemlock spruce of the U. S. and Canada, nat. ord. Coniferæ. It is somewhat softer than the preceding. [For *Extract of Pinus Canadensis*, see page 89.]

Preparations of Tar.

Oleum Picis Liquidæ Rectificatum, Rectified Oil of Tar, a volatile oil distilled from tar, and containing a great variety of compounds, including hydrocarbons, phenols, etc., among the latter being Creosote and Phenol. Dose, ℥j-v [av. ℥iij].

Syrupus Picis Liquidæ, Syrup of Tar, strength ½ per cent. of Tar. Dose, ʒss-ij [av. ʒj]. Is merely a sweetened tar-water.

Unguentum Picis Liquidæ, Tar Ointment, has 50 per cent. of Tar.

Physiological Action.—The agents enumerated in the foregoing list resemble each other very closely in their general actions. *The Turpentine*s are all diuretic, stimulant, antispasmodic, rubefacient, hæmostatic and anthelmintic, in large doses irritant, producing gastro-enteritis and ulceration of the intestinal mucous membrane; and in toxic dose they are paralyzant to the nerve-centres in the cerebrum, cord and medulla. Externally applied they are rubefacient, and highly antiseptic. Their virtues are wholly due to their volatile oil, the *Oil of Turpentine*, which is extremely active. Its vapor inhaled causes nasal and bronchial irritation, headache, and perhaps bloody urine and strangury, sneezing, a tight sensation about the eyes and dyspnoea. In small doses internally, it stimulates the vaso-motor centres, causing a rise of arterial tension; but larger doses paralyze the same and lower the blood-pressure accordingly; affecting the nerve-centres in the cerebrum, spinal cord and medulla, in the order stated, causing diminution of voluntary movement, then lowered reflex action, and lastly slowed respiration. It is excreted by the various channels of elimination, especially by the kidneys and the lungs, which are stimulated to increased action by small doses; but after large ones the kidneys suffer particularly, the urine being suppressed, pain in the lumbar region, burning in the urethra, hæmaturia and strangury.

Tar resembles the turpentine in its action, and as it contains both Creosote and Phenol, it has some qualities which are referable thereto. *Pitch* is a cutaneous stimulant. *Thuja* and *Savin* are irritant and may produce abortion, their oils being frequently used for that purpose. *Savin* is supposed to congest the pelvic viscera in women. *Juniper* is a stimulant diuretic of considerable activity in disease, but does not seem to increase the flow of urine in health. Its oil acts similarly to turpentine, but is more efficient upon the kidneys.

Therapeutics.—The external uses of these agents will be considered under the title RUBEFACIENTS further on. Internally, they have many applications; but, on account of their great activity as internal remedies, they are not very manageable, and hence are not popular medicines. In: *Phosphorus Poisoning*, the oldest oil of Turpentine (containing ozone), is an efficient antidote, preventing the formation of phosphoric acid, and converting the phosphorus into an insoluble substance resembling spermaceti. This has recently been proved to be valueless.

Hysterical Affections, Turpentine is an efficient antispasmodic, especially when used in combination with Ether (1 part to 3).

Tapeworm, Oil of Turpentine is an efficient tæniacuge, if given in large

doses (3j-ij), with Castor Oil to insure its rapid passage through the intestinal canal, in order that it may not be absorbed.

Pulmonary Affections, such as bronchitis, acute and chronic; laryngitis, emphysema, phthisis with tendency to hemorrhage, etc., Turpentine, Terpin, Terebene, and Tar, are very useful agents, being employed by inhalation as well as internally, as stimulating expectorants and antiseptics.

The chief use for the Turpentine group is for external application as rubefacients. The use of these preparations internally is being more and more restricted.

URIC ACID ELIMINANTS (See note below)

***Lithium Salts** (see page 64), especially the Carbonate, gr. ij-xv [av. gr. vijss]; the Citrate, gr. v-xx [av. gr. vijss]; and the Salicylate, gr. v-xx [av. gr. xv].

Salicylates (see page 198), especially that of Sodium, gr. v-xxx [av. gr. xv]; and of Strontium, gr. v-xxx [av. gr. xv].

Sodium Phosphate (see page 63), gr. xx-3j [av. gr. xxx], especially if given with alkalies.

Hexamethylenamina, Hexamethylenamine (Urotropin), and other compounds of Formaldehyde (see page 211), are assumed eliminants of uric acid. Dose, gr. j-x [av. gr. iv], in water or carbonated water.

***Piperazinum, Piperazin, Diethyl-diamine**, is a synthetical basic compound formed by the action of Ammonia upon Ethylene Bromide, and occurs as a white, crystalline powder, readily soluble in water. It liquefies when exposed to the air, from which it greedily absorbs water and CO₂. With uric acid it forms in the test-tube a very soluble urate, requiring but 50 parts of water for its solution, while lithium urate requires 368 of water to dissolve it. Piperazin is non-toxic, non-irritant to mucous membranes, is readily absorbed from the stomach and disappears almost entirely. Some have thought it neutralizes and dissolves gouty deposits, facilitating their removal from the tissues, but no experimental evidence supports this view; in fact, what piperazin is recoverable in the urine is in combination with the stronger acids. Dose, gr. v-xv.

NOTE.—The heading of this group is retained as a memorial to the shades of a deceased theory. It was once widely believed that gout and rheumatism were due to retention in the tissues of uric acid and the

urates; and that the drugs herewith grouped were efficient solvents and eliminants of the uric acid family. Urinalysis proves, however, that these "eliminants" fail to increase uric acid discharge; and clinical evidence fails to show that they modify chemically the course of the disease. Moreover, investigators have discarded the uric acid theory concerning rheumatism; consequently, the present therapy collapses to the ground.

URINARY SEDATIVES

Urinary Sedatives are not evacuants, but may be considered in connection with the other remedies affecting the urine. They act in a sedative manner upon the whole extent of the urinary tract, through the medium of the urine, which, being charged with them, brings them into contact with the genito-urinary mucous membrane (see page 39). One of the more efficient is a recent addition to the pharmacopœia, viz.:

Sabal, *Saw Palmetto*, the partially dried ripe fruit of *Serenoa serrulata*, the Saw Palmetto, nat. ord. Palmæ. It is sedative to the urinary passages, and has been used with asserted benefit in the enuresis of old men. The fluidextract has been used in prostatic enlargement, incontinence of urine, vesical catarrh, irritable bladder, and urethritis. The basis for these claims is scattered clinical observations only; pharmacological evidence is lacking. Dose, gr. x-3j [av. gr. xv]. The official preparation, a fluidextract, is given in doses of ℥xv, 3 or 4 times a day.

**Elixir of Saw Palmetto and Santal Compound*, each fluidounce represents Saw Palmetto berries 3ij, Corn Silk 3ij, Sandal-wood gr. xxx. Dose, 3j-iv, 3 to 6 times daily.

EMMENAGOGUES

Aloes (see page 225), and other purgatives, of which the former is the most efficient, as it determines blood to the pelvic viscera. Pil. Aloes et Ferri, ij pills every 8 hours.

***Apiolum**, *Apiol*, is a non-volatile, oily liquid, of green color, acid reaction, and pungent taste, extracted from the fruit of *Petroselinum sativum*, Parsley (nat. ord. Umbellifæræ). It is probably a mixture of several substances, and is used in France as a remedy for the amenorrhœa of

anæmia, in one dose of gr. xv. It is inert as an emmenagogue, but active as an article of commerce.

Baths, Hot foot, thigh and hip baths at time of the expected period.

This is by far the best treatment for simple suppressed menses. It may well be combined with hot drinks.

Ferrum, Iron (see page 51), is used as a tonic emmenagogue, especially the Pills of Aloes and Iron, ij every 8 hours.

Strychnina, Strychnine, as a spinal stimulant, and equalizer of the circulation (see page 163). Dose of the sulphate, gr. $\frac{1}{60}$ – $\frac{1}{20}$.

Viburnum Prunifolium, Black Haw (nat. ord. Caprifoliaceæ), is a sedative to the uterine and ovarian nerve-centres. It is used as an anti-abortive, and in ovarian irritation, and irregular menstruation with dysmenorrhœa and menorrhagia. The fluidextract is official, and may be given in doses of ℥x–xl̄v [av. ℥xxx], with aromatics, nervous sedatives, or Cannabis Indica. *Viburnum* is highly valued by those who have used it as a remedy for uterine pains. Though not generally classed among the emmenagogues, being rather a uterine sedative, this agent often promotes the menstrual flow by relieving pain and irritation of the ovaries at the period. This conclusion is entirely empirical.

Other Drugs which have been recommended by uncritical observers are Boric Acid, Cantharides, Caulophyllum, Manganese and Thuja, which have no emmenagogue action; Hedeoma Ruta, Savin and Tansy, which are severe and dangerous gastro-intestinal irritants if used in doses sufficient to induce an occasional reflex uterine hemorrhage; Quinine, which is echolic sometimes but not emmenagogue; and Mustard, for a possible counterirritant effect.

Action and Uses of Emmenagogues.—As explained on page 28, agents which promote menstruation may be arranged in two groups, according as they act by *Direct* stimulation of the uterine and ovarian apparatus, or by *Indirect* means, as the correction of anæmia, of disturbed pelvic circulation, etc. The rational use of emmenagogues demands a correct knowledge of the indications. From the time *regular* menstruation is established until the climacteric amenorrhœa may be due to any of the following: (a) pregnancy and lactation; (b) cold and exposure at the menstrual period; (c) anæmia; (d) psychic influences, like fear and shock; (e) change of climate; (f) pelvic disease; (g) constitutional disease; [(h) anatomic defects]. Emmenagogues, as such, are indicated in (b) and (c) only. Amen-

orrhoea from cold and exposure is best treated by hot food and sitz baths, and hot drinks internally with possibly some hot Viburnum. Amenorrhoea from anæmia is best treated by diet, fresh air and exercise, and Bland's pill, gr. iij, t.i.d.

ANTHELMINTICS

Aspidium, *Filix-mas*, *Male Fern*, the rhizome of *Dryopteris Filix-mas* and *D. marginalis*. Contains *Filicic Acid*, a green, fatty Oil, a Volatile Oil, etc.

Oleoresina Aspidii. Dose, gr. xx-3j [av. gr. xxx]. 3jss has caused death.

***Chenopodium**, *American Wormseed*, the fruit of *Chenop. ambrosioides*.
Oleum Chenopodii. Dose, Mv-xv, thrice daily, then a cathartic.

***Cusso**, *Kousso* (*Brayera*), the female inflorescence of *Hagenia abyssinica*. Contains a principle, *Koussin*, which by itself is apparently inert. Dose, 3ij-3j [av. 3iv].

Granatum, *Pomegranate*, the bark of the root of *Punica granatum*. Contains *Punico-tannic Acid* and a mixture of alkaloids, *Pelletierine*.

Fluidextractum Granati. Dose, Mx-3j [av. Mxxx].

**Decoctum Granati* (3ij ad Oj). Dose, 3iv-vj every hour, up to Oj.
Pelletierina Tannas. Dose, gr. iv, followed by a cathartic.

***Kamala**, *Rottlera*, the glands and hairs from the capsules of *Mallotus Philippinensis*. Dose, 3j-iiij, repeated in 4 hours if necessary.

Pepo, *Pumpkin-seed*, the seed of *Cucurbita pepo*. Dose, 3j in emulsion, or three half-3 doses of the Expressed Oil, followed by a cathartic.

Quassia, gr. x in Oj aqua, as injections against the *Oxyuris Vermicularis* (thread-worm).

Santonica, *Levant Wormseed*, the unexpanded flower-heads of *Artemisia pauciflora*. Contains *Santonin*, a crystalline neutral principle.

Santoninum, *Santonin*. Dose, gr. ¼-iiij [av. gr. j], as per age, with Calomel.

**Trochisci Santonini*, each troche contains gr. ss of *Santonin*. Dose, j-v, as per age.

Spigelia, *Pinkroot*, the root of *Spigelia marilandica*, the *Carolina Pink*. It contains a bitter principle, a volatile oil, tannin, etc. Dose of the fluidextract, for an adult 3ss-ij [av. 3j]; for a child of 3 years, Mx-xx.

Terebinthina, Turpentine (see page 234). Dose, of the Oil ℥ss-ij, combined with a purgative, as Castor Oil.

Thymol (see page 207), is almost specific against the *Ankylostomum Duodenale* (*Uncinaria Americana*), in 3 or 4 doses of gr. x-xx in capsules, care being taken that it is not followed by any alcoholic drink, or any oils or fats.

Anthelmintics used against the *Ascaris Lumbricoides* (round-worm) are Santonin, Chenopodium, and Spigelia, those against the *Oxyurus Vermicularis* (thread-worm) are the same, aided by injection of weak decoctions of Quassia or Aloe, or Phenol, gr. x ad Oj aquæ; those against the *Tæniæ* (tape-worms) are Aspidium, Granatum, Cusso, Kamala, Pepo, and Turpentine. Chloroform is sometimes used as a tæniafuge, and with very great success, in ℥j doses in ℥j of mucilage, for an adult, followed by ℥j of Castor Oil. For the specific action of Thymol see above.

TOPICAL AGENTS

COUNTERIRRITANTS

Counterirritants are irritant agents applied to the skin in order to excite a reflex influence upon a remote or deep-seated part (see page 31). They are divided into Rubefacients, Epispastics, and Pustulants; the two latter divisions are very rarely used.

RUBEFACIENTS

Camphora, Camphor (see page 123), is mildly rubefacient and is generally used in connection with other similar agents.

Linimentum Camphoræ has 20 per cent. of Camphor, in Olive Oil 80.

Linimentum Saponis, Soap Liniment, has of Camphor 4½, Soap 6, Oil of Rosemary 1, Alcohol 72½, and Water to 100.

Capsicum is the fruit of *Capsicum fastigiatum*, Cayenne Pepper, a plant of the nat. ord. Solanaceæ, to which Belladonna, Stramonium, Hyoscyamus and Dulcamara also belong. Contains an alkaloid resembling Coniine in odor, and a thick, red liquid, *Capsicin*, which is the active principle. Capsicum in powder is often adulterated with red lead.

Tinctura Capsici, 5 per cent. Dose, ℥v-xx [av. ℥viiij]; as a gargle ℥ss-ij in ℥vj of water.

Emplastrum Capsici is an excellent warming plaster. Each square 6 inches contains about gr. iv of the Oleoresin of Capsicum.

Chrysarobinum, Chrysarobin, is a neutral principle extracted from *Goa-powder*, a substance found in cavities of decay in the trunk of a Brazilian tree of the nat. ord. Leguminosæ. It is often improperly named "Chrysophanic Acid," and, used locally, it produces diffuse dermatitis, often followed by follicular and furuncular inflammation. It is a useful application in psoriasis and vegetable parasitic diseases, but should not be used over a large surface at one time.

Unguentum Chrysarobini, strength 6 per cent.

Menthol, Peppermint Camphor (see page 207), dissolved in alcohol, or the Oil of Peppermint, which contains Menthol.

Pix Liquida, Tar, an empyreumatic oleo-resin (see page 236).

Oleum Picis Liquidæ, Oil of Tar, soluble in alcohol.

Sinapis, Mustard, the seeds of *Sinapis alba* and *Brassica nigra*, plants of the nat. ord. Cruciferae. Both contain *Myrosin*, a ferment, which in the presence of water acts on *Sinalbin* in white mustard, and on *Sinigrin* in black mustard, producing *Acrinyl Sulpho-cyanate* in one and *Allyl Sulpho-cyanide* in the other case, these being the rubefacient agents.

Oleum Sinapis Volatile, Volatile Oil of Mustard (Allyl Sulphocyanide), is soluble in alcohol. Dose, $\text{M}\frac{1}{6}$ – $\frac{1}{4}$.

Emplastrum Sinapis, Mustard Paper, each square inch has about gr. vj of black mustard.

**Linimentum Sinapis Compositum* has of the Volatile Oil 3, Fluidextract of Mezereum 20, Camphor 6, Castor Oil 15, Alcohol to 100.

Terebinthina, Turpentine (see page 234).

Oleum Terebinthinæ, Oil of Turpentine (Spirits of Turpentine), is soluble in 3 volumes of alcohol.

Linimentum Terebinthinæ, Turpentine Liniment, has of the oil 35 parts with Rosin Cerate 65.

EPISPASTICS

Cantharis, Cantharides (Spanish Flies), the beetle *Cantharis vesicatoria*, an insect of the order Coleoptera, is the agent in general use for the purpose of blistering. It contains *Cantharidin*, the active principle, also a greenish volatile oil.

Tinctura Cantharidis, 10 per cent. strength. Dose, Mjss , externally.

Ceratrum Cantharidis, Blistering Cerate, has 35 per cent. of Cantharides, with Wax, Rosin, Lard, and Petrolatum.

Collodium Cantharidatum, Blistering Collodion, has 60 per cent. of Cantharides, with Collodion and Chloroform.

Ammonia, the *Stronger Ammonia Water* (see page 66), is an efficient blistering agent when its vapor is confined.

Mezereum, *Mezereon*, the bark of *Daphne Mezereum*, nat. ord. Thymeleaceæ, when recent is a powerful local irritant, speedily producing vesication.

**Fluidextractum Mezerei* is an ingredient of the *Linimentum Sinapis Compositum*, which was formerly official (see page 243).

PUSTULANTS

Oleum Tigllii, *Croton Oil* (see page 229), a small quantity rubbed into the skin, produces a pustular eruption which heals by scabbing, and may leave cicatrices.

**Linimentum Crotonis* (B. P.), has of the Oil 1 part, in 3½ each of Alcohol and Oil of Cajuput. It is a useful pustulant application being more manageable than the oil itself.

Antimonii et Potassii Tartras, *Tartar Emetic* (see page 68), causes a vesicular and pustular eruption, when rubbed into the skin, the vesicles being umbilicated like those of variola.

Physiological Action.—The action of irritants upon the circulation of an inflamed part is very similar to that of heat or cold, in that the result of either application is the relief of tension in the vessels, and consequently the relief of pain and decrease of inflammation. *Heat* acts directly, dilating the capillaries of the collateral circulation, and thereby diverting the current from the inflamed area. *Cold* acts indirectly, causing reflex contraction of the afferent vessels, and diminishing the supply of blood to the inflamed part. *Irritants* cause dilatation of the vessels of the part to which they are applied, but contraction of the vessels in other parts of the organism, acting by a reflex stimulation of the vaso-motor centre. *Counter-irritation* acts by reflexly stimulating such organs or parts as have nerve synapses in that segment of the spinal cord receiving sensory fibres from that portion of the skin being irritated. By increasing the activity of the circulation in their immediate vicinity, counterirritants also promote the reabsorption of inflammatory products; and when employed for this purpose they should be applied directly over the organ or tissue affected.

Therapeutics.—Counterirritation, when intelligently employed in accordance with the above-mentioned principles, is an exceedingly efficient and valuable measure, for (a) the relief of pain, (b) the decrease of local inflammation, and (c) the reabsorption of inflammatory products. Hence its applications are very numerous, and its area of employment a very wide one, admitting only the citation of a few instances to serve as illustrations. In:

Pericarditis, a counterirritant upon the thoracic wall, at some distance above the præcordia, will help to lessen congestion and consequently to lower the inflammation.

Pleuritic Effusion, to promote absorption, the counterirritant should be placed directly above the area affected.

Pneumonia, to promote reabsorption after consolidation, an energetic rubefacient directly over the affected part.

Neuralgia, of superficial nerves, may be controlled by counterirritation over the painful nerve; or over the spinal column at the "tender point" corresponding to the intercostal nerve affected.

Vomiting from any cause is always helped by a rubefacient application over the epigastrium.

Joint Effusions, or thickening, a treatment of value is the use of a rubefacient in the vicinity of the affected part.

Acute Rheumatism, counterirritants around the joints are of great value not only for the local inflammation, but also for the general disease, upon which they often seem to have a curative influence.

Chronic Bronchitis and Pleurisy, counterirritants over the chest, in order to keep up a continuous moderate irritation.

EMOLLIENTS AND DEMULCENTS

Adeps, Lard, is the prepared internal fat of the abdomen of the hog, purified by washing, melting and straining.

Adeps Benzoinatus, Benzoinated Lard, has 1 per cent. of Benzoin.

Adeps Lanæ Hydrosus, Hydrous Wool Fat (Lanolin), see page 46, under OILS AND FATS, for this and Cod-liver Oil, Cotton-seed Oil, Cacao-butter, and others.

**Ichthyolum, Ichthyol*, see page 70, under SULPHUR. It is used as an Ointment (10 to 50 per cent.) for many affections of the skin due to capillary dilatation.

Linum, Linseed (Flaxseed), the seed of *Linum usitatissimum*, Flax, a cultivated plant of the nat. ord. Linaceæ. Contains much mucilage in the covering of the seeds, and in the seed itself one-fourth to one-third by weight is the oil, *Oleum Lini*, Flaxseed or Linseed oil; which is obtained by expression without the use of heat. *Linseed-meal* is the powdered cake, remaining after the oil has been expressed.

Oleum Lini, Linseed Oil, the fixed oil. Dose, ʒss-ij [av. ʒj].

Linimentum Calcis. Lime Liniment (Carron Oil), has equal volumes of Limewater, and Linseed Oil, shaken together.

**Infusum Lini*, Linseed or Flaxseed Tea, has of Linseed, ʒiij, Licorice-root ʒj, infused in 10 ounces of boiling water for 2 hours, and strained. Dose, indefinite.

Mel, Honey, is a saccharine secretion deposited in the honey-comb, by *Apis mellifica*, the honey bee, an insect of the order Hymenoptera. Honey consists of a strong aqueous solution of mixed dextrose and levulose, the sum of which, known as "glucose," amounts generally to 70 or 80 per cent.

Mel Depuratum, Clarified Honey, is Honey warmed, skimmed and strained, with 5 per cent. of Glycerin added.

Mel Rosa, Honey of Rose, contains 88 per cent. of clarified honey.

**Oxymel* (B. P.), Honey 40, Acetic Acid 5, Water 5.

Petrolatum, Petrolatum (commonly called Vaseline, Cosmoline, Petroleum Ointment, etc.), is a mixture of hydrocarbons, chiefly of the marsh-gas series, obtained from petroleum by distilling off the lighter portions and purifying the residue. It is insoluble in water, soluble in boiling alcohol, ether, chloroform, oils, etc., and is official in three other forms, viz.:

Petrolatum Album, White Petrolatum.

Petrolatum Liquidum, Liquid Petrolatum.

Paraffinum, Paraffin, a mixture of solid hydrocarbons.

Sevum Præparatum, Prepared Suet, is the internal fat of the abdomen of the sheep, purified by melting and straining. It should not be used after it has become rancid.

Physiological Action and Therapeutics.—The substances, of which the above are only a few examples, have a medicinal action which is chiefly mechanical, forming a smooth and soft coating to an inflamed mucous membrane or to a portion of the skin denuded of its epidermis, protecting it from irritation by the air, and permitting the process of repair

to proceed unchecked by any external interference. Some of them, in addition, soften and relax the tissues (emollients), thereby lessening tension, and consequently relieving pain. *Flaxseed* is the favorite material for *poultices*, which are simply local baths, conveying heat and moisture to the part. It has the additional quality of being emollient, due to its mucilaginous and oleaginous constituents; and hence is one of the most efficient agents of the class to which it belongs, though highly objectionable from the aseptic point of view. *Linseed Oil* is frequently applied to burns, scalds, eczematous eruptions, etc., either by itself, or with lime-water, as in the old-fashioned "Carron Oil," now known as *Linimentum Calcis*. Internally, in doses of \mathfrak{z} ij morning and evening, it has been highly spoken of as a cure for hemorrhoids. *Honey* is chiefly used as a vehicle, and as an ingredient of gargles. It is laxative in full doses. A mixture of honey and vinegar (official in the B. P. as *Oxymel*) is a favorite remedy for colds and sore throats. *Petrolatum*, known commercially as *Cosmoline*, *Vaseline*, etc., is a valuable protective, and an excellent basis for ointments, having no acidity, and no liability to turn rancid. It mixes readily with the alkaloids, the phenol compounds, and many other active agents; but it does not penetrate the skin as readily as animal fats and fixed oils (for which see page 46).

PREScription-WRITING

Extemporaneous Prescriptions are formulæ written by the physician on the instant (*ex tempore*), to meet the requirements of individual cases.

A prescription should begin with the name of the person for whom it is designed, and the date on which it is written. Then follows the Latin word *Recipe*, usually abbreviated by the sign \mathcal{R} , and signifying "Take," or "Take thou;" next the names and quantities of the ingredient to be used, which are also expressed in Latin; then the direction to the compounder, followed by the direction to the patient, the last being now usually expressed in English; and finally the signature of the prescriber.

A Prescription then has four component parts, viz.:

SUPERScription, which consists of the name of the party for whom it is designed, the date, and the sign \mathcal{R} , signifying "Take thou."

INSCRIPTION, the body of the prescription, consisting of one or more of the following subdivisions:

Basis, or chief active ingredient.

Adjuvant, to assist the action of the basis.

Corrective, to correct some injurious quality of the other ingredients.

Vehicle or Excipient, to give the prescription a suitable form.

SUBSCRIPTION, the directions for the compounder, usually expressed in contracted Latin.

SIGNATURE, the instructions for the administration of the medicine, in English or Latin, followed by the signature of the prescriber.

A prescription may, however, contain the base alone, or the base with the adjuvant, or the base with a simple vehicle or diluent. A single ingredient may serve a double or a treble office, as the Aromatic Syrup of Rhubarb with Quinine, in which the syrup serves as an adjuvant to increase the action of the quinine, as an excipient to cover the taste, and as a vehicle to facilitate the administration of the dose directed. Again, the base may need no aid in doing its work, and may require no corrective of its action, nor any special vehicle. On the other hand, there is no limit to the number of ingredients that may be used, *provided that the prescriber has a clear idea of something to be accomplished by each one*, and also provided that there is no chemical or medicinal incompatibility between them. Formerly prescriptions were very complex, and contained a great many curious and incongruous ingredients. As Dr. Piffard has well said, "the tendency of the present age is toward mono- rather than poly-pharmacy, and prescriptions with the orthodox *adjuvans* and *corrigens* are less frequently seen than formerly." There is danger, however, in carrying this simplicity too far, for there is no doubt that proper combinations of medicines will often produce effects for the patient's good which could not be obtained from the use of any one remedy.

Procedure in Writing a Prescription.—The first step is to write the name of the patient, the date, and the sign *Rj*. Then the title of each ingredient should be written in Latin and in the genitive case, except that when only a certain number of an ingredient is to be used the ingredient should be in the accusative case, as for example, "*Vitellum unum*, one Yolk-of-egg." Next the quantity of each ingredient sufficient for one dose should be mentally determined, and multiplied by the number of doses which the mixture, etc., is to contain, and the result set down in signs and numerals opposite the designation of each article. Directions to the pharmacist and for the patient being added, and the prescriber's name or initials being affixed, the prescription is completed. Frequently, the ingredients and their quantities for but one dose, in pill, powder, suppository, etc., are named, with instructions to make a certain number after the formula prescribed. When an unusually large dose of any poisonous drug is prescribed, it is customary to underline the quantity, so as to call

the attention of the compounder to the fact that the large dose is ordered intentionally.

An Example will perhaps make the foregoing more comprehensible, and at the same time serve to indicate the style of writing usually employed. The following formula represents the preparation known as "*Black Draught*," but officially styled the *Compound Infusion of Senna*; approximate weights and measures being substituted for the pharmacopœial metric weights.

| | | | |
|--|--|-------------------------|-------------------|
| <i>For Mrs. Gray.</i> | | <i>July 7th, 1916.</i> | } SUPERScription. |
| <i>Recipe, Take:</i> | | | |
| (Basis) | { <i>Senna, semiunciam,</i> of Senna, half an ounce, <i>Magnesi Sulphatis,</i> of Magnesium Sulphate, | | } INSCRIPTION. |
| (Adjuvant) | { <i>Manna ana unciam unam,</i> of Manna, of each an ounce, | | |
| (Corrective) | { <i>Fœniculi, drachmam unam,</i> of Fennel, one drachm, | | |
| (Vehicle) | { <i>Aqua Bullientis, fluiduncias octo,</i> of Boiling Water, eight fluid- ounces. | | |
| <i>Macera per horam in vase clauso, deinde cola.</i> Macerate for an hour in a closed vessel, then strain. | | | } SUBSCRIPTION. |
| <i>Signetur, Mark or Write, thus—A wineglassful</i> <i>every four hours till it operates.</i> | | | |
| | | <i>T. F. Wood, M.D.</i> | } SIGNATURE. |

Abbreviated in the style usual among physicians, the above prescription would read as follows, viz.:

| | | |
|---|------------------------|-----|
| <i>For Mrs. Gray.</i> | <i>July 7th, 1916.</i> | Gm. |
| <i>R. Senna.....</i> | <i>ʒss or 15</i> | |
| <i>Magnesi Sulph.,</i> | | |
| <i>Manna.....</i> | <i>ʒʒ ʒj or 30</i> | |
| <i>Fœniculi.....</i> | <i>ʒj or 4</i> | |
| <i>Aqua Bull.....</i> | <i>f ʒviii or 250</i> | |
| <i>Mac. per hor. in vase clauso, deinde cola.</i> | | |
| <i>Sig.—A wineglassful every four hours, 'till it operates.</i> | | |
| <i>T. F. Wood, M.D.</i> | | |

As the result of the above is nearly identical with the official preparation, we might write the same prescription more simply, as follows:

R. Infusi Senna Compos., ʒviii.

with the proper superscription and signature; this being the manner of prescribing the official preparations.

It will be noticed that in the above analysis the term "basis" covers two ingredients; but it is obvious that either of them might be considered the principal agent, and the other one classed as an adjuvant.

"These four parts of a formula are intended to accomplish the object of Asclepiades, *curare cito, tute et jucunde*; in other words, to enable the basis to cure quickly, safely and pleasantly" (Pareira).

Another Example will illustrate the mental operations which should always be followed by a prescriber; for no matter how good a memory he may have, he will surely make a grievous mistake some day if he follows the practice of writing prescriptions from memory. Furthermore, the unscientific character of the latter habit will, when appreciated, prevent any educated physician from indulging in it. Every prescription should be written with a definite purpose in view, consequently the mind of the prescriber should weigh each step carefully, and should avoid all slavish subjection to ready-made formulæ.

Suppose, then, that we wish to order for Miss Graham an emulsion of Castor Oil flavored and sweetened so as to make it less disagreeable to the taste than it naturally is. If the ingredients were simply mixed together, as in the previous example, the result would be an unsightly preparation, consisting of sweetened and flavored water with the oil floating on top. So we require that the process of emulsification be first accomplished, by which the oil is minutely subdivided and suspended in the water, by the aid of the emulsifier, which may be any viscid excipient, as gum, soap, or yolk-of-egg. Taking the last-named for the emulsifying agent, we would begin by writing down in order the following terms, as stated in italics, viz.:

For Miss Graham,

June 10th, 1916.

R. (Take thou)

Olei Ricini (of Oil of Castor)•

Vitellum (Yolk-of-egg),

Terre bene simul: dein addo (Rub well together; then add)

Having gone so far, we begin to think of an agreeable vehicle, and choosing from the many Syrups at our disposal that of Ginger, and from the flavored Waters that of Cinnamon, we write further for these as the ingredients to be added, thus:

Syrupi Zingiberis (of Syrup of Ginger).

Aqua Cinnamomi (of Cinnamon-Water).

The ingredients are now all entered upon the prescription, but their respective quantities have not yet been decided on. We proceed, then, by first taking into consideration the total quantity of the medicament required, which, in this case, as the preparation is intended to purge the patient, need not embrace more than one or two doses. As it is well to provide for a repetition of the dose, in case the medicine should not act sufficiently, we will decide upon two doses in all. Now, the average adult dose of Castor oil is about a tablespoonful, or half-an-ounce, and as we want two such doses we insert the sign and numeral fʒj, or simply ʒj, opposite the title of the oil, which is written in the genitive case. But to emulsify it properly we need about one-half as much of the emulsifying agent, and we may express this by writing for half-an-ounce of yolk-of-egg, or for the yolk of one egg, or for one yolk-of-egg, which weighs about half-an-ounce. This would be expressed in Latin by either of the following methods, viz.:

Vitelli semi-unciam (ʒss). One half-ounce of Yolk-of-egg.

Vitellum ovi unius (j). The Yolk of one egg.

Vitellum unum (j). One Yolk-of-egg.

As the word *Vitellus* means Yolk-of-egg, we may omit the word *Ovi*, and accepting the latter as the better style, insert the numeral j opposite the word *Vitellum*, which is properly in the accusative case. The whole quantity so far specified is one ounce and a half, and if we add two and a half ounces of diluent, we shall have a four-ounce mixture, or the full of a regular-sized bottle, as found in the shops. There being considerable viscosity already present in the emulsion we do not need much syrup, so we assign to the Syrup of Ginger the odd half-ounce, leaving two ounces of the Water to make up the total bulk of four fluidounces.

The prescription now only requires for its completion that the subscription and signature be added. We proceed to admonish the dispenser by telling him to mix the ingredients together, and therefore write the word *misce*, or the abbreviation *M* commonly used therefor; and to further point out the nature of the preparation we add, *let be made an emulsion*, or in Latin, *fiat emulsum*, the passive verb taking as predicate-nominative the thing into which the making is to be. The final words *Label*, or *Write thus* are expressed by the term *Signetur* (*Let it be entitled*), followed by the directions for the patient or the person who is to administer the medicine, which should be in English, though they may be written in Latin. Our completed prescription will stand thus:

| | |
|--|-------------------------|
| <i>For Miss Graham.</i> | <i>June 10th, 1916.</i> |
| <i>R. Olei Ricini,</i> | <i>℥j</i> |
| <i>Vitellum,</i> | <i>j</i> |
| <i>Tere bene simul, dein adde—</i> | |
| <i>Syrupi Zingiberis,</i> | <i>℥ss</i> |
| <i>Aqua Cinnamomi,</i> | <i>℥ij</i> |
| <i>M. fiat emulsum.</i> | |
| <i>Sig.—“One-half at once, to be repeated next day if required.”</i> | |
| | <i>Potter.</i> |

The last entry of the inscription might be written thus: *Aqua Cinnamomi, quantum sufficit ad ℥iv*, meaning “of Cinnamon-Water as much as may be necessary to [bring the whole quantity to] four ounces,” usually expressed in contracted style, thus:

Aq. Cinnamomi, q. s. ad ℥iv.

This style is preferred when any of the quantities are approximations, and the final item cannot be exactly stated to secure a certain total. In the foregoing case, the one yolk-of-egg might measure a little more than the half-ounce assigned to it; but by using the *q. s. ad* style at the end, we make sure of getting a total of exactly four fluidounces.

In more complicated prescriptions, the mode of reasoning is precisely the same; practice, care, and knowledge of the whole subject being necessary to the production of those elegant prescriptions which are correctly termed “magistral,” as the work of a *magister*, or master of his business.

Metric Prescriptions are written or compounded with sufficient accuracy, by considering a milligramme as equal to the $\frac{1}{60}$ of a Troy grain, a gramme as equal to 15 Troy grains, and a cubic centimeter (or milliliter) as being equal to 15 minims or one-fourth of a fluid drachm. All other terms, units or prefixes, belonging to the metric system, may be wholly ignored by both physician and pharmacist. The decimal point after the gramme or the cubic centimeter should always be replaced by a line, so as to avoid errors, which in many cases might prove serious, from the misplacement of a point, the dropping of an ink-spot, or the intrusion of a fly-speck.

The simplest method of writing a prescription in metric terms, is to first write it as though prescribing but *one dose* of each ingredient in grains or minims and decimals thereof; then by substituting the term “grammes” or “cubic centimeters” for the grains and minims the prescription is correct for fifteen doses in metric terms. For example:

| | One Dose. | 15 Doses Metric. |
|------------------------------|---------------------------------|------------------|
| B. Quininsæ Sulphatis,..... | gr. j | 1 |
| Strychninæ Sulphatis,..... | gr. $\frac{1}{4}$ or 0.016..... | 016 |
| Fluidextr. Glycyrrhizæ,..... | ℥iv | 4 |
| Syrupi,..... | ℥℥x | 60 |

This gives a two-ounce mixture approximately, of which the dose would be "a teaspoonful thrice daily,"

The above rule will answer for all liquids except those which are very heavy (as Syrups and Chloroform), or very light (as Ether). Measures may be entirely discarded and all fluid quantities expressed in grammes. The average drop of water may be taken as equal to 0.05 c.c., the teaspoonful to 5 c.c., the tablespoonful to 20 c.c., the \mathfrak{S} to 30 c.c. (or grammes), and \mathfrak{S} viii to 250 c.c. (The new U.S.P. substitutes *milliliter* for *cubic centimeter*.)

Renewals.—It would be advisable for physicians to always write the words *Non Repetatur*, or some similar direction, on all prescriptions which should not be repeated without their sanction. By so doing they would doubtless cut off a good many renewal charges from the receipts of druggists who would fear the legal consequences of disobeying the mandate.* This inconvenience to the drug-seller would be more than compensated for in protection to the drug-taker, who too frequently carries in his pocket-book a stock of recipes for his various complaints; and in protection to the physician, who by giving up the dispensing of his own medicines has placed it in the power of the druggist to connive at direct robbery of the just reward of a professional skill and knowledge.

Principles of Combination include certain maxims which should never be lost sight of. To prescribe as few remedies as possible, and to order no powerful drug without a distinct idea of its office in the prescription, are, perhaps, the chief; to which may be added another, namely, to give powerful agents by themselves when required for their physiological impression on the system.

Medicines are combined for several purposes: (1) to increase, correct or modify the action of another medicine; (2) to obtain the joint action of two or more diverse remedies; (3) to obtain by chemical reaction a special combination, which is either a new remedy, or which acts as a

* According to the Harrison Law, 1915, no physician may prescribe any habit-forming drug unless he hold a Federal license and uses numbered blanks; he must also write in full his name and the name of his patient. Nor may he dispense such drugs unless he keep on file an accurate record subject at any time to Federal inspection.

new remedy; (4) to give a suitable form for administration or for preservation.

INCOMPATIBILITY

Incompatibility may be Chemical, Pharmaceutical or Therapeutical, according as the combination results in chemical decomposition, physical disassociation, or antagonistic physiological action. The first kind may be intentional, for the purpose of obtaining a new substance as the result of the chemical action; for example, the prescribing of Calomel or Corrosive Sublimate with Limewater, to produce respectively the black and yellow Oxides of Mercury.

Dangers of Incompatibility may in a great measure be avoided by the use of the utmost simplicity in prescribing. The subject can only be glanced at within these pages, but the following simple rules may help the burdened memory of the student and the practitioner.

Never use more than one remedy at a time, if one will serve the purpose.

Never use *Strong Mineral Acids* with other agents, unless you know exactly what reaction will ensue. They decompose salts of the weaker acids, and form ethers when combined with alcohol. Never combine *free acids* with hydroxides or carbonates.

Select the simplest solvent, diluent or excipient you know of, remembering that the solvent power of alcohol and of water for their respective substances decreases in proportion to the quantity of the other added.

Generally do not combine two or more soluble salts; for such salts in solution, when brought together, usually exchange their radicles, thereby forming an insoluble compound.

The following more or less insoluble salts will be formed whenever the materials of which they are composed are brought together in solutions; the Hydroxides, Carbonates, Phosphates, Borates, Arsenates and Tannates of most earthy and heavy metals and alkaloids, and the metallic Sulphides; the Sulphates of Calcium, of Lead, and the subsalts of Mercury; the Chlorides, Iodides, and Bromides of Bismuth, Silver, Lead, and Mercury; the Iodides of Quinine and Morphine, and of many other alkaloids.

Never order a drug in combination with any of its Tests or Antidotes.

Never prescribe a *Glucoside* (as Santonin, Colocynthin, etc.), in combination with *free acids* or with a substance containing *Emulsin*, as these agents will decompose it.

Aconite should be ordered in water alone, *Corrosive Mercuric Chloride* by itself in water or in simple syrup. The latter drug is incompatible

with almost everything, even the Compound Syrup of Sarsaparilla being said to decompose it.

Potassium Iodide decomposes most of the metallic salts, and is one of those drugs which are best administered alone.

Resinous Tinctures or Fluidextracts (e.g., Tinct. Cannabis Indicæ), when combined with aqueous solutions, should always have Acacia or some other emulsifying agent added, to prevent the separation of the resin, which otherwise will be deposited on the sides of the bottle or will float on top of the mixture.

Silver Nitrate and the *Acetate* and *Sub-acetate of Lead*, though incompatible with almost everything, may be combined with *Opium*, the latter forming therewith a compound which, though insoluble, is therapeutically active as an astringent and anodyne lotion. *Silver Nitrate* with *Creosote* forms an explosive compound.

Tannic and Gallic Acids, and substances containing them (as the Astringent Bitters), precipitate albumin, alkaloids and the most soluble metallic salts. They may be prescribed with the proto-salts of Iron, but not with its per-salts. *Calumba* is the best vegetable tonic to use with Iron salts, as it contains neither tannic nor gallic acid. *Tannic Acid* precipitates gelatin.

Iodine and the soluble *Iodides* are incompatible with the alkaloids and substances containing them, also with most metallic salts.

Alkalies neutralize free acids, and precipitate the alkaloids and the soluble non-alkaline metallic salts. *Oxides of the Alkalies* decompose salts of the metals proper and salts of the alkaloids, precipitating their bases; but the base may be soluble in an excess of the alkali.

Poisonous Compounds may be formed by the admixture of several substances in solution, such as:

Potassium Iodide or the Syrup of the Iodide of Iron, with Potassium Chlorate.
Potassium Cyanide or Dilute Hydrocyanic Acid, with Calomel, Bismuth salts, metallic hydroxides, carbonates, subnitrates or subchlorides, forming poisonous cyanides.

Explosive Compounds result from mixing powerful oxidizing agents with others which are readily oxidizable. The chief members of these two classes are as follows:

Oxidisers

Nitric Acid. Chromic Trioxide.
Free Hydrochloric Acid.
Nitro-hydrochloric Acid.
Potassium Chlorate.
Potassium Permanganate.

Oxidisable or Combustible

Glycerin, Sugar, Alcohols.
Oils, Ethers, Tannin.
Sulphur and Sulphides.
Dry Organic Substances.
Phosphorus. Hypophosphites.

Table of Precipitant Solutions

The following table shows the most important instances of solutions which mutually precipitate each other, the letter P meaning "forms a precipitate with:"

| Solutions of | Alkaloidal Solutions (generally) | Metallic Solutions (generally) | Solutions of Lead Salts | Solutions of Silver Salts | Solutions of Calcium Salts | Solutions of Magnesium Salts | Solutions of Albumin | Solutions of Gelatin |
|--------------------------------------|-------------------------------------|-----------------------------------|----------------------------|------------------------------|-------------------------------|---------------------------------|----------------------|----------------------|
| Alkalies..... | P | P | P | P | P | P | ... | ... |
| Tannic Acid..... | P | P | P | P | ... | ... | P | P |
| Carbonic Acid and Carbonates.... | P | P | P | P | P | P | ... | ... |
| Sulphuric Acid and Sulphates..... | ... | ... | P | P | P | ... | ... | ... |
| Phosphoric Acid and Phosphates.. | P | P | P | P | P | P | ... | ... |
| Boric Acid and Borates..... | P | P | P | P | ... | ... | ... | ... |
| Hydrochloric Acid and Chlorides..... | ... | ... | P | P | ... | ... | ... | ... |
| Hydrobromic Acid and Bromides..... | ... | ... | P | P | ... | ... | ... | ... |
| Hydriodic Acid and Iodides..... | P | ... | P | P | ... | ... | ... | ... |
| Sulphides..... | ... | P | P | P | ... | ... | ... | ... |
| Arsenical Preparations..... | ... | P | P | P | ... | ... | ... | ... |
| Albumin..... | ... | P | P | P | ... | ... | ... | ... |

Pharmaceutical Incompatibility differs from chemical incompatibility in the absence of chemical action, and generally occurs when one substance is added to another which, through differences in solubility, causes a precipitation of solid matter or a separation of part of the liquid. The separated constituents may be active and hence important, or inert and therefore unimportant. Instances of this are the addition of an acid to a Quinine and Licorice mixture, resulting in precipitation of the Glycyrrhizin (relied on to cover the taste of the Quinine) by the acid; or the use of Quinine, Tincture of Ferric Chloride and Licorice together; or the prescribing of solutions of Hydrated Chloral and Potassium Bromide with an alcoholic preparation, the Chloral separating to the top as an alcoholate, and therefore dangerously in excess for the first few doses.

When a fluidextract is diluted with a liquid differing in composition from those used in the fluidextracts, the gum, albumin, resin, and mucilage

are often separated. In such a case as Fluidextract of Cannabis Indica the active resin would be thrown out of solution, and floating on top might cause serious symptoms; but in many other instances the precipitate would be inert and filtration would be in order. Water is the solvent for albuminous, gelatinous, gummy, and saccharine bodies and for a large number of inorganic salts; while Alcohol is the solvent for volatile oils and resins, gum-resins, resinoids, balsams, and all drugs containing these as their active principles. The solvent power of either Alcohol or Water for their particular substances decreases in proportion to the amount of the other added.

Instances of Pharmaceutical Incompatibility

Resinous Tinctures or Fluidextracts with Aqueous solutions.
 Tinctures of Guaiac with Spirit of Nitrous Ether.
 Compound Infusion of Gentian with Infusion of Wild Cherry.
 Compound Infusion of Cinchona with Compound Infusion of Gentian.
 Essential Oils with Aqueous liquids in quantities exceeding 1 drop to ʒj.
 Fixed Oils and Copaiba with Aqueous liquids (except excipients).
 Tinctures made with Alcohol with those made with Diluted Alcohol.
 Alcoholic Tinctures and Fluidextracts with Aqueous preparations.
 Spirit of Nitrous Ether with strong Mucilages.
 Infusions generally with Metallic salts.

Therapeutic Incompatibility arises when two agents are administered together which oppose each other in their action on the human system, as for instance Belladonna in any form with Physostigma. But in many cases physiological antagonists are designedly prescribed together, one as a guard against the excessive action of the other, as the hypodermic administration of Morphine guarded by Atropine. The antagonists to the most active medicinal agents may be found in the preceding pages under their various titles.

Latinizing a prescription correctly requires a very limited knowledge of the Latin language, yet that little is sometimes absent from the education of would-be doctors of medicine. Within the small place which can be allotted to this portion of the subject in these pages, it is impossible to offer more than a few notes to guide the student at first. For full treatment of the subject the reader is referred to Pereira's *Selecta & Præscriptis*, which deals fully with every detail of prescription-writing.

PRONUNCIATION

Attention is particularly directed to the accentuation of words commonly mispronounced; as, for example, acêtas, ângina, âtropa, chimá-

phila (*himaphilo*), chlòridum, Codèia, conlum, énama, iódidum, radicis, ricinus, sinâpis, syrûpus, êczema, umbilicus, abdòmen, brómìdum, páresis.

VERBS

The Verbs used in prescription-writing are nearly all in the imperative mood giving direction to the compounder, and having their object in the accusative case. Such are:

Addo, add.

Cole, strain.

Divide, divide.

Extendo, spread.

Fac, make.

Filtra, filter.

Macerò, macerate.

Misce, mix.

Recipe, take.

Signa, write.

Solve, dissolve.

Tere, rub.

Table of Genitive Case Endings

| Nom. | Gen. | Exceptions | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------------|---|---|-----------|--------|-----------|-------|-------|--------|-----------|------|----------|-----------|------|-----------|-------------|--------|--------|---------|---------|---------|----------|----------|----------|--------|-------|--------|------------|---------|---------|---------|
| a | æ | Cataplasma, Enema, Physostigma, Aspidosperma and Gargarysma, all have the genitive in <i>-ætis</i> . Folia is plural, gen. Foliorum. | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| us um os on | i | Rhus, Rhois; Flos, Floris; Bos, Bovis; Limon, Limonis; Brigeron, -ontia. Fructus, Cornus, Quercus, Spiritus, Haustus, Potus, do not change, being of the 4th declension. | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| as | atis | Asclepias, -adis; Mas, Maris; Rheas, Rheados. | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| is | idis | Pulvis, -eris; Arsenis, -itis, Phosphis, -itis, Sulphis, -iths, and names of all salts ending in -is, have the genitive in -itis. | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| o | onis | Mucilago, -inis; Ustilago, -inis; Solidago, -inis. | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| l | lis | Fel, Fellis; Mel, Mellis. | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| e en ps rs r x | es inis pis rtis ris cis | <p><i>Words which do not change in the Genitive</i></p> <table><tr><td>Azedarach</td><td>Cornus</td><td>Hydrastis</td><td>Sabal</td></tr><tr><td>Buchu</td><td>Curare</td><td>Jaborandi</td><td>Sago</td></tr><tr><td>Cannabis</td><td>Digitalis</td><td>Kino</td><td>Sassafras</td></tr><tr><td>Cacoutchouc</td><td>Ethyl*</td><td>Matico</td><td>Sinapis</td></tr><tr><td>Catechu</td><td>Fructus</td><td>Menthol*</td><td>Spiritus</td></tr><tr><td>Chloral*</td><td>Gambir</td><td>Potus</td><td>Sumbul</td></tr><tr><td>Cundurango</td><td>Haustus</td><td>Quercus</td><td>Thymol*</td></tr></table> | Azedarach | Cornus | Hydrastis | Sabal | Buchu | Curare | Jaborandi | Sago | Cannabis | Digitalis | Kino | Sassafras | Cacoutchouc | Ethyl* | Matico | Sinapis | Catechu | Fructus | Menthol* | Spiritus | Chloral* | Gambir | Potus | Sumbul | Cundurango | Haustus | Quercus | Thymol* |
| Azedarach | Cornus | Hydrastis | Sabal | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Buchu | Curare | Jaborandi | Sago | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cannabis | Digitalis | Kino | Sassafras | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cacoutchouc | Ethyl* | Matico | Sinapis | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Catechu | Fructus | Menthol* | Spiritus | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chloral* | Gambir | Potus | Sumbul | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cundurango | Haustus | Quercus | Thymol* | | | | | | | | | | | | | | | | | | | | | | | | | | | |

* In the B. P. Chloral, Ethyl, Menthol, and Thymol are Latin nominatives, and do not change in the genitive (e.g., Syrupus Chloral, Liquor Ethyl Nitritus, Emplas-

A few verbs are found in the subjunctive mood, taking their subject or predicate in the nominative case. The most usual are:

| | |
|------------------------------------|-------------------------------------|
| <i>Bulliat</i> , let boil. | <i>Dividatur</i> , let be divided. |
| <i>Capiat</i> , let take. | <i>Fiat</i> , let be made. |
| <i>Coleatur</i> , let be strained. | <i>Fiant</i> , let be made. |
| <i>Coloretur</i> , let be colored. | <i>Signetur</i> , let it be marked. |
| <i>Datur</i> , let be given. | <i>Sumatur</i> , let be taken. |

PARTICIPLES

Participles or Verbal Adjectives are occasionally used, and should agree with their respective nouns in gender, number and case. Such are the following, viz.:

| |
|--|
| <i>Adhibendus</i> , -a, -um, to be administered. |
| <i>Dividendus</i> , -a, -um, to be divided. |
| <i>Sumendus</i> , -a, -um, to be taken. |

PREPOSITIONS

Those in the first column require the noun following to be in the accusative case, those in the second column require the ablative case.

| | |
|---|-----------------------|
| <i>Ad</i> , to, up to. | <i>Cum</i> , with. |
| <i>In</i> , into. | <i>Pro</i> , for. |
| <i>Supra</i> , upon. | <i>Sine</i> , without |
| <i>Ana</i> , of each, is usually followed by the genitive case. | |

SUNDRY WORDS AND PHRASES, IN MOST FREQUENT USE

| | | |
|--|-----------------------------|---|
| <i>Bene</i> , well. | <i>Non</i> , not. | <i>Numero</i> , to the number of. |
| <i>Bis</i> , twice. | <i>Numerus</i> , number. | <i>Quantum sufficiat</i> , as much as is necessary. |
| <i>Dein</i> , thereupon. | <i>Octarius</i> , a pint. | <i>Pro re nata</i> , according to need. |
| <i>Et</i> , and. | <i>Semel</i> , once. | <i>In partes aequales</i> , into equal parts. |
| <i>Gradatim</i> , gradually. | <i>Simul</i> , together. | <i>Redactus in pulverem</i> , let it be pulverized. |
| <i>Guttatim</i> , by drops. | <i>Statim</i> , at once. | <i>Secundum artem</i> , according to art. |
| <i>In dies</i> , daily. | <i>Ter</i> , thrice. | |
| <i>Da</i> , give. | <i>Quater</i> , four times. | |
| <i>Non repetatur</i> , let it not be repeated. | | |
| <i>Ad saturandum</i> , to saturation. | | |

trum Menthol). In the U. S. P. the corresponding nominatives are Chloralum, Æthyl, Menthol and Thymol; but the genitive of Æthyl is Æthylis, and that of Thymol is Thymolis (e.g., Æthylis Carbamas, Thymolis Iodidum).

ABBREVIATIONS

Abbreviations are in general use in prescription-writing, but should be avoided as much as possible. Their lavish use is a sign of the prescriber's ignorance of Latin, they confound the compounder, enhance the chances of error, and are therefore a frequent source of danger to the patient. In the larger works on pharmacy, very full lists of the commonly used abbreviations are given. The following list gives a few examples of the dangers of carelessness in their employment.

Aconit., may mean either Aconitum or Aconitina.

Ac. Hydroc., Acidum Hydrochloricum or Acidum Hydrocyanicum.

Chlor., Chlorum, Chloral, or Chloroformum.

Hyd. Chlor., Hydrated Chloral, Hydrargyri Chloridum.

Zinc. Phos., Zinci Phosphas or Zinci Phosphidum.

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